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April 1992

MODEL AIRPLANE NEWS

THE WORLD'S PREMIER R/C MODELING MAGAZINE

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APRIL 1992 VOLUME 120, NUMBER 4

MODEL AIRPLANE NEWS

THE WORLD'S PREMIER R/C MODELING MAGAZINE

***ON THE COVER**: at the Scale Masters, Charlie Baker's T-28B Trojan is shown canted a little sideways because of a crosswind gust. (Photo by Rich Uravitch; see his coverage inside.)*

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EDITORIAL

TOM ATWOOD

IS THE AMA MEETING MODELERS' NEEDS?

ACTING ON invitations I had received over the last year, I recently visited the AMA headquarters in Reston, VA, to get a first-hand view of current AMA priorities and plans—from the people who are charged with executing AMA operations.

Vince Mankowski, AMA Executive Director and the head of the Reston operation, was available to discuss just about any AMA-related topic. Bob Underwood, Technical Director, and Geoffrey Styles, PR/Marketing Director, also gave me a lot of their time. Subjects that are topical today among modelers, judging from letters we receive, are the Muncie acquisition, AMA responsiveness to modeling concerns and the likely impact of the new Sport Flyers Association (SFA). What would the AMA have to say on these topics?

AMA Executive Director Vince Mankowski (left) and Editor-in-Chief Tom Atwood discuss the AMA.

The Reston office believes that Muncie will promote aeromodeling in ways that cannot otherwise be accomplished. They say Muncie is within 600 miles of two-thirds of the U.S. population, so most modelers are theoretically within a long day's drive. It's believed the site will become a modeler's Oshkosh, i.e., a Mecca for major national and international meets, contests and exhibitions, and the primary site for the Nats. Although Indiana does get cold in the winter, Vince reported less snow fell in Muncie last year than in Washington, D.C. He pointed out that, from an administrative standpoint, it helps to have a couple of months "off season" during which facilities can be maintained and upgraded.

Why not continue spreading the Nats out among two or three sites that "rotate" around the country? Vince said that having to abide by schedules and field restrictions of others, with all the waste-disposal problems and none of the cash-generating (e.g., concession stand) advantages, is costly and a huge administrative burden. A single, primary site would turn this situation around. Vince also commented that ample funds exist for the purchase of four or five large, regional flying sites around the country—to be managed and run by local modelers. According to what I was told, this is a priority.

Vince said that if local modelers can show the AMA Executive Council that they can design, build, administer and maintain a large regional flying site, then the AMA will look favorably on purchasing the land and paying taxes thereafter. A first example is the 154-acre site in Visalia, CA. In January, the AMA approved the payment of $10,000 to the sponsoring group for environmental impact research, which is the next step in the path toward acquiring the site. Sites of this magnitude can cost $250,000 just for the land. The AMA believes that a series of large sites could significantly promote the growth of aeromodeling in our society—and they may be right.

As for AMA responsiveness, I was told that if two or three modeling clubs jointly author a letter that clearly expresses a concern or identifies a problem, then the Executive Council is bound to seriously review that letter at its next meeting. District VP's owe a duty first and foremost to the furtherance of aeromodeling (this is a legal requirement, given association purposes), not just to their district constituencies. So a compelling letter seeking a particular result will include arguments that focus on the general advancement of aeromodeling. One of the most pressing needs is for the acquisition of new flying sites. Vince said that under another new program, the AMA will offer letters of credit to assist local clubs in the purchase of local flying fields.

As could have been expected, I was also assured the AMA is in sound financial condition. Vince mentioned that members who want a detailed accounting of AMA expenditures are free to come to the Reston office to get the facts (they would have to pay for photocopying costs, etc.).

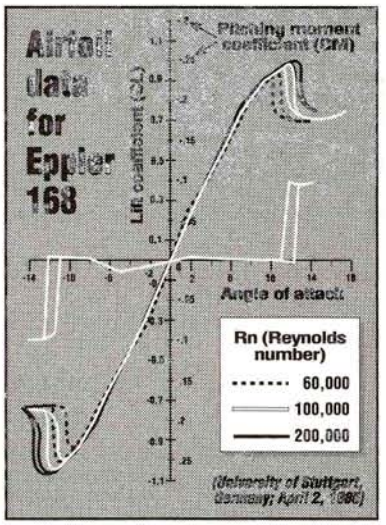
How does the AMA regard the SFA? I was told that the AMA will protect its position vis-à-vis this new competition by striving, in as many ways as possible, to do a better job serving its membership. Will the AMA turn around its current PR problem and reinvigorate the confidence of its membership in its leadership ability? Modelers must do their part, too, by voting in the right people in AMA district elections. Competition is good, and the emergence of the SFA arguably will compel the AMA to do a better job. Will the AMA follow through with the current plan to acquire several large, regional flying sites? If so, will this best promote the advancement of aeromodeling? Will the AMA aggressively assist local clubs that wish to purchase flying sites? Only time will tell.

AIRWAVES

WRITE TO US! We welcome your comments and suggestions. Letters should be addressed to "Airwaves," **Model Airplane News,** 251 Danbury Road, Wilton, CT 06897. Letters may be edited for clarity and brevity. We regret that, owing to the tremendous numbers of letters we receive, we cannot respond to every one.

ERRATA

• February: in "How to: Retracts Made Easy" by Michael Smith (page 88), we gave an incorrect address for Peak Performance. Correct address: 4245 Northwest 114th Ave., Sunrise, FL 33323.



FOILED AGAIN?

If you carefully examine figure 2B on page 56 of the February '92 issue of Model Airplane News, in my article "Reducing Drag, Part 2," you'll find that the lift coefficient curves are incorrectly identified as to Reynolds number. As printed, this shows that at low Reynolds numbers, this airfoil's lift is greater than at higher Reynolds numbers. This is not correct.

ANDY LENNON
Dollard Des Ormeaux
Quebec, Canada

Andy, we publish the corrected plot on the Eppler 168 airfoil here—this time, with the high and low Reynolds numbers correctly identified (as published, they were transposed). Sorry for the mistake. If this airfoil had produced a higher coefficient at lower Reynolds numbers, at least it would have been a heck of a model airfoil! TA

PLANS PRODUCER

I'm responding to a letter from Robert G. Tarplee, Cincinnati, OH, in the January '92 "Airwaves." I've spent countless hours searching for scale R/C kits of some not-so-well-known WW I and WW II aircraft as well as some of the more popular warbirds. Since I'm a licensed airframe and powerplant mechanic and my hobby for the past 10 years has been restoring antique aircraft, I have, on several occasions, drawn my own scale prints of what I wanted to model.

I use manufacturers' three-views and erection prints so that I have as much detail as I want. I spend a lot of time calling around the country to find what I need, then I simply scale the prints to the size I want. After that, I add ribs, formers, gussets, bracing, gear, canopy, cowl, etc.

If manufacturers' prints are available, I can make complete scale prints to build a better flying model airplane. If I can be of any service to you or your readers, feel free to contact me. Tell Mr. Tarplee that my second scale print was an AT-11 Kansan: wingspan—40 1/2 inches; length—25 3/4 inches; scale—1/15. I can be reached at (817) 581-8300 between 8:00 a.m. and 3:00 p.m., Central Standard Time.

ARTHUR C. RIGG
N. Richland Hills, TX

Arthur, for many would-be scratch builders the only thing lacking for that "super project" is a useable set of plans. You may have provided the answer for some of our readers, and we thank you for your kind offer.

In a call to Arthur, we learned he has designed plans for several precision scale model aircraft, including the AT-11 mentioned, an AT-6 Texan with a 52-inch wingspan, an F8F-2 Bearcat with a 52-inch wingspan, and eight or nine others. Arthur designs his plans from original manufacturers' and 3-D cutaway drawings. He has built both static and R/C models (some are nearly exact miniatures, e.g., with linkages that move pedals when the rudder is moved). Arthur is willing to share ideas as well as to sell plans; contact him for details. Arthur, I hope Mr. Tarplee gives you a call! GY

BULLDOG BUILDER

I have enjoyed *Model Airplane News* for many years—been a modeler for 50 years. I'm a retired Air Force fighter pilot. Per-

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haps you could tell me how to acquire a set of plans for Don Neil's Hall Bulldog (featured in your November '91 issue).

JACK AUSTIN
Midwest City, OK

Jack, the Hall Bulldog is an unusual, beautiful aircraft. We've heard that several have been built and that all fly extremely well. Don Neil sells plans for $30 (folded) and $35 (rolled in a tube). Call him or write to him at 1120 S. 40th Street, Lincoln, NE 68510; (402) 488-7509. GY

WHEN MODELING WAS MODELING

The picture on the cover of your January '92 issue, which you say was first published in 1930, could have been me.

I was 11 and building model airplanes—more or less. It was very discouraging. The picture on the box was beautiful, and you'd be full of enthusiasm—the wonderful things a young boy's imagination can dream up. I guess that made it worth the effort.

When you opened the box, there would be a few flimsy sheets of balsa with outlines of various pieces to be cut out—barely visible. Mostly, you had to guess. There would be something that almost looked like a propeller, some rubber bands, bamboo strips, rice paper, piano wire, wooden wheels and a plan sheet that sure didn't look like the picture on the box; and the completed model looked even worse. After winding up the rubber-band-driven prop, you released it about 2 feet above the living-room floor, and it might go 10 feet—landing upside-down. If you released it any higher, it would completely disintegrate when it hit the floor.

Now, if a youngster buys a model of, say, an F-16, he winds up with an F-

(Continued on page 10)

AIRWAVES

(Continued from page 9)

16—not a bunch of junk, like we did! Today's models are great, and the kits, engines, radios and all the parts available are fantastic. And I'm still doing it! I also flew P-47s during WW II. That's what modeling did for me.

FRANK H. FLORES
Ida Grove, IA

Frank, I think many of us remember struggling with rubber-powered models when we were young. Yet will you ever forget the first time you saw one of these humble aircraft, after being launched on a lazy summer day, catch a thermal and really soar! We agree that the diversity of models available today is truly amazing by comparison, and we believe the educational and recreational benefits they can provide the younger generation are as important as ever. Thanks for your sharing your recollection! TA

GOOSE CHASE

I've been a modeler for about 45 years and followed *Model Airplane News* for most of the period.

I suddenly had the urge to scratch-build a Ford Tri-Motor Tin Goose S-AT-C. Checking plan sources, I was astonished to find that the only ones available cost $50 to $75 for the plans alone!

In your plans catalogue, you have it for electric flight with a 60-inch span, but I hesitate to use them for a single 4-stroke to .40 for instance.

I found in the January/February and March/April '65 issues of *American Modeler* magazine, a two-part article and plans for the Goose in 77 1/2-inch span with a single Fox .59. These plans were available through Hobby Helpers, 1543 Stillwell Ave., New York City, as plan no. 265. Do you or any readers know where Hobby Helpers is now, or who might have acquired their plans and whether they're still available?

ARTHUR R. PERRY
Berlin, MD

Arthur, we aren't familiar with Hobby Helpers, but perhaps our readers are. We'll pass along any info we receive about the Tin Goose. I did check on our plans for it; we offer the A.T.5., which is suitable for a single .19 to.21 2-stroke engine. It's well-designed and, with two dummy O/B engines, it should fly nicely.

I also found a plan for a 74-inch-wingspan version for .40 to.45 4-stroke engines—plan MW2146, 90/91 R/C Model World Plans & Construction Guide from Bob Holman Plans, P.O. Box 741, San Bernardino, CA 92402; (714) 885-3959. Give Bob a call and he'll tell you how to order. GY

HISTORY FOR SALE

Since you're a well-known publication in the arena of R/C airplanes, I'm contacting you for advice on the disposition of an extensive R/C collection.

My late husband, Vincent Catanzarite, was a participant in the building and flying of R/C model airplanes for over 40 years. At the time of his untimely death in December, 1990, at the age of 58, he had an unparalleled collection. This collection includes:

—46 ignition engines
—269 glow engines
—142 unassembled kits
—68 completed planes
—30 complete radios
—40 used radios
—boxes of servos, receivers, fuel tanks, rubber bands, mufflers, spinners, motor mounts, wheels, propellers, and unopened hardware packages.

I'm trying to find a buyer for the entire collection. If you could give me any advice, I'd greatly appreciate it.

JULIA CATANZARITE
Las Vegas, NV

Julia, a collection like this could form the core of a major museum display. Check with the Academy of Model Aeronautics, which maintains perhaps the largest such museum, to see whether it's interested in acquiring the collection. Contact Colonel Hurst Bowers at the AMA museum: (703) 435-0750.

I'm sure that many of our readers will be interested in the collection. Interested parties should call Mary Morton at (702)-456-2615 for details. Ms. Morton is administering the sale of the collection and can provide a detailed inventory. She hopes to sell the entire collection to a single buyer. We wish them the best in this effort! TA

(Continued on page 108)

FIFTY YEARS AGO

ART SCHROEDER

DEVELOPING AVIATION'S FUTURE

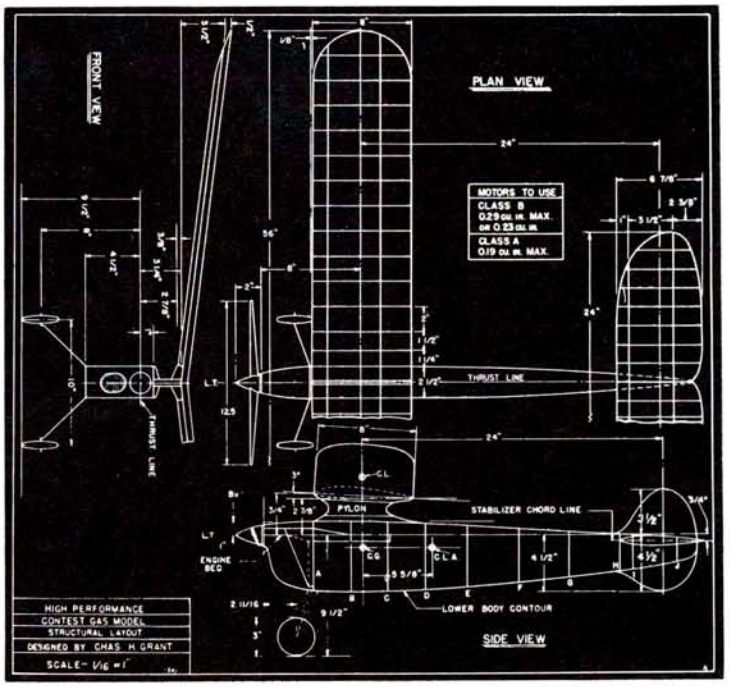
A HALF CENTURY ago, model aviation had reached a high level of recognition by government and military officials. With America at war, it was recognized that the country's critical pilot, technician and engineer requirements would be met in great measure by young people from modeling's ranks. Many of the modeling industry's advertisements in *Model Airplane News* recognized this: Cleveland Model and Supply Co. quoted an Air Corps primary flying school student, "My work with models saved more than three months training period." *Scientific Models* allowed that "the model builder of today will be the aviation expert of tomorrow." Skychief engines were created for "the future men of American aviation." Phantom Motors trumpeted: "In these times of national emergency, you can do your part by learning the theory of aviation." Berkeley used the familiar phrase, "Keep 'Em Flying," and Rogers Motor Co. pointed out that, "truly, the boy or young man with a Rogers is a mechanic in the making, preparing to serve his country." Forster Brothers felt that "many a young man's future career in aviation will have its beginning with his first successful powered airplane flight!" And, those of us active in 1942 believed all of this—our advance toward a future in aviation through modeling, the service to our country through that preparation—indeed, most truly believed the patriotism and importance of it all. Why? Because it was true!

A great number of America's modelers went on to serve with distinction in the war effort. Every facet of full-scale aviation found committed modelers involved; some flew, some fixed, some designed and tested, others built—all served!

It's a pity that modeling's influence (still strong today) isn't generally recognized. Perhaps this is an area of PR that the AMA should be pushing forward in popular media. Modeling still develops engineers, pilots, astronauts and scientists. It's still a fertile field to those for whom flying isn't a routine, humdrum daily occurrence.

The April '42 issue featured a continuing series by Charles Hampson Grant (*Model Airplane News* editor from 1932) on model designing, titled (logically) "Model Designing Simplified"—a 19-part treatise on theory, structure and free-flight trimming. It all culminated in a quite modern-looking, Class B (.20 to 29c.i. engine), pylon free flight. The airplane would be ideal today for electric power with its high-lift Grant X-9, under-cambered airfoil.

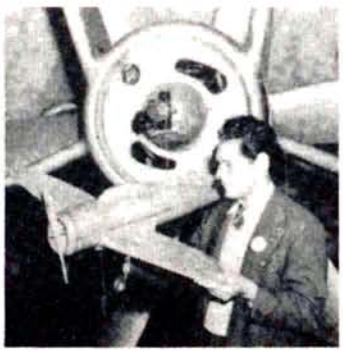
In the structure portion of the series, Grant analyzed tension and shear in airframes, use of sheet-wood covering in areas of high stress, a removable motor, landing gear, an ignition-system unit and a practical, "rubber-banded" pylon for wing mounting. The model could be likened to a small, updated, stylized version of the famed KG. Perhaps its greatest charm lay in its relative obscurity. It would be different on today's sport field. Charles Grant will always be remembered as a true innovator in both full-scale design and



Class B (.20-.29c.i. engine) plyon free-flight design by Charles Hampson Grant.

low-speed (model) aerodynamics.

Fifty years ago, *Model Airplane News* included a popular mix of full-scale and modeling coverage that continues even to today. With the war in full swing, more and more information was offered on both aircraft advances at home and on enemy aircraft our forces were encountering.



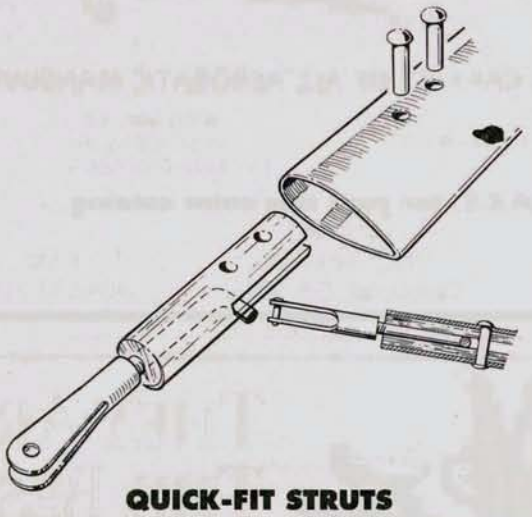
A Republic fighter wind-tunnel test model was modified many times by skilled model builders before the prototype aircraft was built.

Premier aviation author, Robert McLarren, presented a feature on the soon-to-become legendary B-17E Flying Fortress. The Boeing design was considered so important at that point in the war that three companies (Boeing, Vega and Douglas) were involved in construction of the hundreds made each month. McLarren prophetically said, "History will record the part these Super Flying Fortresses played to prove that 'weak' democracy can muster far greater power than 'strong' dictatorship." American involvement in the war was only months old, but *Model Airplane News* was already thoroughly covering the conflict and all its flying machines. It was a fascinating and terrible time!

HINTS & KINKS

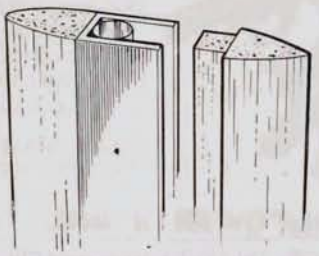
JIM NEWMAN

Model Airplane News will give a free one-year subscription (or one-year renewal if you already subscribe) for each idea used in "Hints & Kinks." Send a rough sketch to Jim Newman c/o *Model Airplane News*, 251 Danbury Rd., Wilton, Ct 06897. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO, AND NOTE YOU SUBMIT. Because of the number of ideas we receive,we can't acknowledge each one, nor can we return unused material.



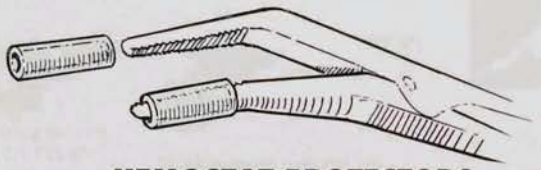
QUICK-FIT STRUTS

To simplify the attachment of struts (especially on 1/4-scale models), use heavy-duty metal clevises instead of screws and nuts. Cut a dowel plug, slit it as shown, and then drill it to accept a threaded rod. Secure this attachment in the streamlined alloy tube strut with some epoxy and a couple of rivets. *George Daniels, Ceres, CA*



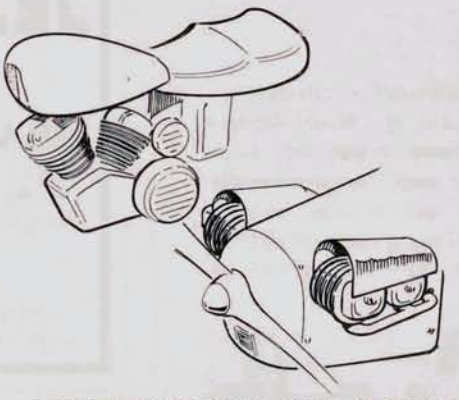
CABANE AND GEAR FAIRING

The plastic "grip-strip" binding material used to make these fairings is available at office-supply stores. Glue the balsa leading edge to the flat side of a strip that has been cut to the same length as the strut, and then clip the assembly over the wire. If you need a wider fairing, pry open the plastic strip and slip a piece of trailing-edge stock into place. Secure it with a drop or two of CA. *David Byrd, Johnson City, TN*



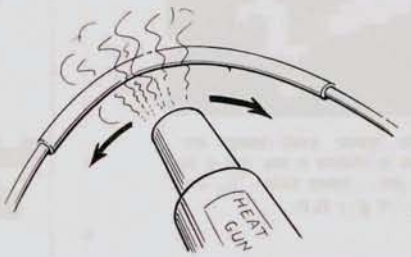
HEMOSTAT PROTECTORS

The teeth on hemostats can damage delicate materials. To prevent this, slip short pieces of rubber fuel line over the ends of the tool.
John Rice, Los Angeles, CA



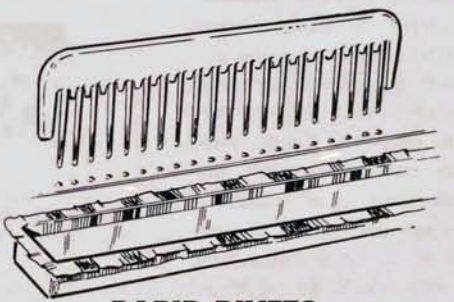
DUMMY ENGINE CYLINDERS

Cut the plastic cylinders off a toy Harley Davidson, and mount them to your Goldberg Cub. To enhance the front even more, mount a couple of wooden dummies aft of the plastic ones. (It's best to put them under the baffle, so they'll be less conspicuous.) *Dan Tadmor, Tivon, Israel*



PERMANENTLY CURVED PUSHRODS

Although flexible nylon pushrods bind when they're bent too much, they work extremely well when they're bent slightly. This hint works for fairly tight curves (radiuses as small as 2 inches). Join the inner and outer tubing, and bend it slightly. Heat the tubing with a hot-air gun until it softens; after it has cooled, it will remain curved. Within the normal servo-operating range, these rods work just as freely as if they were straight! They're ideal for glider T-tails, and you can bend them *after* they've been installed. *Malcolm Richards, Whangarei, New Zealand*



RAPID RIVETS

Here's a way to make 10 or more rivets in a single stroke! Break the alternate teeth off a hair comb, dip it into a shallow tray of white glue, and quickly touch the model with it. Clean the teeth regularly to keep the rivet size consistent. If you don't have a suitable tray for the glue, you can make one by lining balsa with foil. *Tore Hansen, Drammen, Norway*

AIR SCOOP

CHRIS CHIANELLI

New products or people behind the scenes—my sources have been put on alert to get the scoop! In this column, you'll find news that will, at times, cause consternation, and telepathic insults will probably be launched in my general direction! But who cares?—it's you, the reader, who matters most! I spy for those who fly!

R/C WORLD CIRCLE

Twenty-year modeling veteran Y.P. Jahagirdar has traversed the Indian continent with his R/C airplane, north and south from Kanyakumari to Kashmir (3,700km) and east to west from Karachi to Dhaka via Delhi (3,000km). All these flights were monitored by the Aero Club of India. Now the Indian adventurer is making plans for a round-the-world flight. As is so often the case with endurance flights, the Hobby Lobby Telemaster was chosen for the task. The modified Telemaster will be refitted with a 4-stroke in place of the O.S. .61 it used for the Indian flights. The ignition system and 3.25-liter tank will increase fuel economy. Y.P. writes, "The flying conditions in India are so adverse, I feel confident about flying in the other parts of the world." I hope the ocean is calm that day, Mr. Jahagirdar. Y.P. is looking for all the international help he can muster (especially in the USA) to help plan routes for avoiding populated and restricted areas. If you want to get in on the Rotary's Trans World Aeromodel Goodwill Flight '92, contact Y.P. Jahagirdar at Fax numbers 011-91 (212) 792574, or 665677.

SPEED 70

The new Webra Speed 70 has an ABC piston/liner combination that incorporates a Dykes ring. According to its manufacturer, this combination has proven to be very effective in increasing torque, so it's at home with larger props like a 14x6 or 12x8—definitely desirable for scale models. The Speed 70 puts out 2.1hp at 16,000rpm and features the proven Webra TN carburetor. It also has a new muffler that reportedly boosts torque without a corresponding increase in noise.

The AL-1 all-aluminum R/C model with a basic structure made of 2024 T-3 aluminum has now been flown five times—an hour of flight time. The airplane has a light aluminum structure and is easy to build without special tools. All surface skinning is accomplished with pop rivets that are solder-filled for a flush finish. In the works are many design improvements, including weight reduction and construction simplification, and two pre-production models should be in the air by May '92. One will be powered by a Saito 300 (twin-carburetor version) and the other by a Sachs 4.2. Estimates are that production kits will follow in early '93. Specifications: wingspan—97.5 inches; wing area—1,660 square inches; length—72.5 inches; dry weight—28 pounds. Special features include a fully cowled engine with enclosed exhaust system, anti-flutter aileron linkage, balanced elevators and removable stab, fin wings and landing gear (for ease of transportation). For more information, contact the Ted Nelson Co., P.O. Box 20637, Reno, NV 89510; (702) 323-4955; Fax (702) 323-2982.

NON-FERROUS FLIER

AIR SCOOP

SON OF STINGER

Lanier's highly successful giant-scale Stinger will soon be joined by a 1.20 version. The new Stinger will have all the design features that make the big Stinger so fast and easy to build. Like its big brother, the 1.20 features an ABS cowl, a wing-root cover, a turtle deck, a cap-stripped foam wing and one-piece fuselage sides, which greatly reduce the time it takes to assemble the kit. With a wing area of around 1,000 square inches and a flying weight of 8 to 10 pounds (giving an average wing loading of 20 ounces per square foot), the Stinger 1.20 will have all the fantastic flight qualities of Big-Daddy Stinger! Its release date hasn't yet been announced, but you can be sure that Lanier's very own Bubba "lovable large mouth" Spivey will let us know when a date has been decided. Watch for it.

10-FOOT SNIPE

Manufactured by Snipe International, this 171mph, 38hp Norton P73 rotary-powered, 10-foot-span Snipe Mk. V was designed to test the effectiveness of short- to long-range weapons. The Snipe, which can be maneuvered like a piloted, full-scale aircraft, tests short- to medium-range weapons by flying to within the pilot's sight (up to 5.6 miles) using a visual-tracking, pilot-controlled binocular system. For medium- to long-range weapons tests, the Snipe flies out of sight using an auto-stabilizer that controls pitch, roll and altitude for an accurate "attack" profile. Onboard sensors collect data (altitude, engine revolutions and heading) that's transmitted back so it can be used to guide the Snipe on chosen attack profiles and to guide it home for a belly landing or parachute recovery. Thanks to Jeff Petroski of Lancaster, SC, for finding this info for me. He'll receive a complimentary one-year subscription to *Model Airplane News*.

COMPACT SANYO DOME CHARGER

The plug on this super-convenient Sanyo Dome charger folds in, so you can easily carry the charger in your pocket. The unit charges one to four AA cells, and a charge light flashes when they're fully charged. Its available in two models: a one-hour version (NC3) and a five-hour version (NC6). The Dome charger will cost about $30. The new Sanyo AA cells have button contacts so they can be used in any equipment—airplane radio, field fueler, or Walkman. For more information, contact Trinity Products Inc., (908) 862-1705; Fax (908) 862-6875.

BUY ONE  GET ONE FREE!?

We've received many letters requesting information on a commercially available, functioning turbine engine. Although its manufacturer has decided against the "buy one get one free" marketing strategy, the JPX Turbo Jet T240 is available for about $3,000 a pop—or should that be "blast"? Considering the production and development costs required to deliver such a specialized item, the price is expected to be high, especially when precision standards must be up to snuff with full-scale engines to function properly for any length of time.

Speaking of full-scale, JPX also makes microlight engines like the one in the experimental French Cri-Cri—the world's smallest person-carrying twin aircraft. At 4.4 pounds, the T240 is suited to models weighing 13 to 16 pounds. It's 4.33 inches in diameter and 11.8 inches long (for you guys who want to get started on a fitting project while you wait for delivery). Fuel is liquid propane, and starting is accomplished by spooling-up to 10,000rpm with compressed air. Thrust (static, I suppose) is 8.83 pounds at

100,000rpm. According to the manufacturer, all throttle settings between idle and full are reliably attained with very little vibration. For more info, contact JPX, Zone Industrielle Nord, 72320 Vibraye, France.

PILOT PROJECTS

A LOOK AT WHAT OUR READERS ARE DOING

SEND IN YOUR SNAPSHOTS

MAN is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable.

All photos used in this section will be eligible for a grand prize of $500, to be awarded at the end of 1992. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in!

Send those pictures to:
Pilot Projects, Model Airplane News, 251 Danbury Rd., Wilton, CT 06897.

■ FJORD PATROL

Somewhere in the beautiful hills of Hovet, Norway, live Tore Lian and his magnificent 20-pound, 1:3.7-scale, scratch-built Fokker E-III Eindecker, which sports a 100-inch wingspan. Tore says the E-III wings rotate, giving a 1/4-inch throw at the trailing edge, instead of having ailerons. Tore is 57 years old and has been modeling since 1945. We need to hear from more of you healthy Norse modelers.

■ CELLULAR SEA HORSE

Redwood City, California-based inventor and model-aviation pioneer Azam Ali calls this particular research craft the "Sea Horse." Ali's interesting contraption is powered by an Unger 24 turning a three-blade 9x6 pusher prop motor pushed by 24 SR 1500mAh cells and a PDI speed controller. Ali claims the Sea Horse is for "proof of concept design" only, and the craft is presently for surface use only. Considering that Azam used wing sections from an Ultra Sport, however, with the addition of ailerons and more power, the Sea Horse could be renamed the "Horse-Fly"!

■ CAPT. COCO's FLYING CIRCUS

Meet 14-year-old Cory Kent Coco from Moreauville, LA, and his RJL-powered Carl Goldberg Ultimate Bipe. Cory writes, "I've been flying radio-controlled airplanes for two years. I have three planes: a Super Sportster 1.20, a J-3 Cub and the Ultimate, which is covered with Coverite." Cory, with your early, and obviously successful, entry into the world of radio control you can look forward to a life without boredom.

PILOT PROJECTS

1991 PILOT PROJECT WINNERS

All year long, the "Pilot Projects" section in Model Airplane News is a constant reminder that creatively tenacious modelers are to be be found at every corner of the world. It's also a year-long reminder that selecting the winner at the end of the year isn't going to be easy, and it wasn't. Navy Lt. Jeff Laugle "sails" away with the $500 prize, and P.D. Harding and James Ferrell will each receive a one-year subscription to Model Airplane News and a gift set of our books. Congratulations!

PILOT PROJECT OF THE YEAR
☆☆☆1ST PLACE☆☆☆

Allow us to introduce the winner of the 1991 Pilot Project of the Year contest—Navy Lt. Jeffrey J. Laugle and his 82-inch-span Grumman E-2C Hawkeye, which is the Navy's carrier-based AEW (Airborne Early Warning). The K&B .61-powered model is made of balsa and lite-ply and features many fiberglass parts, including the rotodome, that were derived from hand-crafted Styrofoam patterns. The design was created from wind-tunnel drawings provided by Grumman.

When Jeff first submitted his entry, which appeared in the June '91 issue, he was aboard the aircraft carrier Nimitz in the Persian Gulf. Jeff is again out of the country and away from his beautiful bride Tracy who was the energetic liaison between Model Airplane News and the absent Lt. Laugle. Jeff wrote us a follow-up letter during a mission in the Hawkeye on Christmas day! Jeff chose this subject because he flies full-scale Hawkeyes. He has about 1,200 hours logged on them, plus over 100 carrier-arrested landings. Since its appearance in the June '91 issue, Jeff tells us three others have been started. Evidently, we're not the only ones impressed with the Jeff's project. When Airtronics got a look at the partially completed Hawkeye, they were so impressed they donated an 8-channel Quantum PCM radio just to be associated with the endeavor.

Jeff is an outgoing individual and modeler who invites any interested in the Hawkeye to feel free to write to him. His address until September 1992 is VAW-112, FPO, AP 96601-6400.

RICKENBACHER'S RIDE
☆☆2nd Place☆☆

The OS2U-3 Kingfisher, responsible for more downed-pilot rescues than any other mode of recovery during WW II, was the modeling subject P.D. Harding of Spokane, WA, chose. It appeared in the February '91 issue. The 12-pound model has a 76-inch span and is powered by a Super Tigre .75. The superbly detailed Kingfisher even has working landing lights!

3RD-PLACE TRI-MOTOR
☆3rd Place☆

James Ferrell of Flint, TX, built this majestic 15-pound, 105-inch-wingspan Junker JU-52, which is done up with aluminum nacelles that house three Saito .45 4-stroke engines. Each Saito has its own throttle, which increases safety. In case of an outboard engine flame-out, the wing engines can be throttled back while the center engine can be on full during an emergency pattern sequence and landing. James says the sound of the three .45s is "wondrous." We don't doubt it. The JU-52 appeared in the January '91 issue.

FIELD & BENCH REVIEW

BALSA PRODUCTS ENGINEERING'S

PLAYBOY SR.

by JOE BESHAR

BILL FOX OF Guttenberg, NJ, has always been an ardent modeler. During his years of employment as a master toolmaker, and into his retirement, he has built free-flight model airplanes.

He and his son, Tom, who drives down from Vermont, attend many of the free-flight contests as well as the Nats. As Secretary/Treasurer of the Old Time Eagles Model Airplane Club, Bill actively contributes to its administration.

When Bob Peru re-entered the model airplane kit manufacturing business with his company, Balsa Products Engineering*, he and I convinced Bill to try R/C-assist by building one of the Balsa Products kits—the Playboy Sr. Bob Peru owned the Champion Model Airplane Co., which he sold to Davey Systems a few years back—presumably to retire. After sitting around for about two years, it seems that he missed having balsa dust in his nostrils and, bored and uncomfortable with ants in his pants, he organized Balsa Products. In addition to the Playboy Sr., the company currently offers kits for the Buzzard Bombshell, the Brooklyn Dodger and others.

FROM MODERN FREE-FLIGHT TO R/C-ASSIST

Before takeoff, Joe Beshar instructs pilot Bill Fox while Harold Hardstedt holds the Playboy. (All are members of the Old Time Eagles Model Airplane Club).

I thought it would be interesting to follow through with an overview of Bill Fox as an R/C newcomer as well as do a review of the Playboy Sr. In the beginning, Bill, as a devoted free flighter, was very skeptical (you know how they are), but I took on the challenge of convincing him to try R/C-assist. Bill acquired the kit, and I oversaw him as best I could. I even encouraged him by offering him my original Super Cyclone ignition engine. He accepted it and was impressed enough to buy a radio and begin building the Playboy Sr.

THE KIT

As soon as you open the carton of the kit, it's obvious that it's as complete as a kit can be. Supplied are rolled, full-size plans, a shaped leading edge, machine-cut parts, a laminated stabilizer and machine-cut ribs. The parts, the strip wood and the fittings are sorted, bagged, banded and identified as applicable by section. All are neatly packed and well-machined and well-engineered. The wing ribs are jig-notched and packaged for precise assembly. The other supplied packages include wing pegs, control horns, landing gear, engine mounts, etc. The plans for this OT R/C-

assist model are clear, self-explanatory and highly detailed.

CONSTRUCTION

Most Playboys are built with a pylon configuration, but the plans also show a cabin configuration as an option. I talked Bill into constructing his as a cabin version, which is more appealing owing to its window outlines and see-through windshield.

Construction requires a flat building surface and is conventional. During building, the pre-shaped leading and trailing edges are pinned to a Homosote® flat board, the ribs are installed and glued into place, the spars and wing tips are assembled as shown on the plans, and the polyhedral is set by blocking up the wing tips (acknowledging the dimensions shown on the plans) and, finally, gluing the dihedral reinforcements in position. This results in a strong, reliable wing.

The fuselage is also built on a Homosote® flat board, and it's made of 3/16-inch-square balsa strips. The two sides of the fuselage are assembled and then removed from the board. The assembly is then set on the top view in the plans where cross-braces are installed. The supplied plywood firewall and landing gear are glued to the front of the fuselage frame, and the engine mounts and the engine are installed.

The elevator and the rudder are also constructed on a flat surface by conventional means. All the cut pieces are supplied for the leading and trailing edges, the ribs and the tips. The spars, the tips and the ribs are fitted and glued as shown on the plans, and the movable elevator and rudder are hinged in place as detailed. All this conventional construction leads to rapid completion.

The plans provide a basic outline of the cabin configuration. (This is how the Cleveland Model Airplane Co. originally published the plans for this model. They were designed by Joe Elgin, back in the early '40s.) There's enough detail on the plans to

FLIGHT PERFORMANCE

- **Takeoff and landing**
  As with all tail draggers, slight right rudder is needed on takeoff. With a high-lift, undercambered airfoil, the plane tends to pitch up under power. To avoid this, you must adjust the downthrust to establish the same trim under power as in the glide. When you've achieved the right level of downthrust, the plane will climb without zooming. Downthrust is usually 3 degrees, but a more powerful engine may require as much as 5 degrees. After downthrust has been properly adjusted, the plane will practically fly itself. Its inherent stability and slow glide make landings almost automatic . (The plane would make an excellent trainer.)

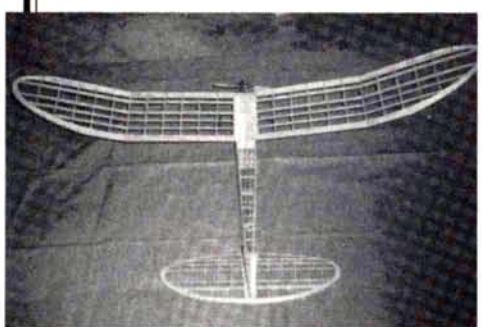
- **High-speed performance**
  With properly adjusted downthrust, the plane requires minimal or no trim adjustment when moving from low to high throttle. The plane climbs rapidly.

- **Low-speed performance**
  To achieve maximum glide, a Robart* incidence meter should be used to set up the proper incidence angle as shown on the plans. It's best to start with the stab set at 0 degree and the wing set at +2 degrees. Fine-tuning adjustment for the best glide ratio can be achieved by shimming the wing 1/2 degree either way in its wing saddle. With optimal trim, the plane is a real "floater."

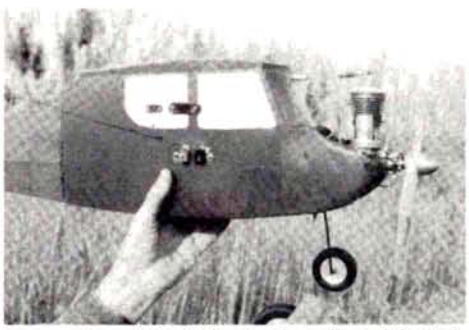
- **Aerobatics**
  The Playboy was designed to climb and glide rather than to do aerobatics. It will perform loops, but they aren't recommended. Rolls are difficult to manage because of the high wing. The plane is designed for duration. Maximum flight duration in SAM competition is 7 minutes. (This is accomplished with as little as an 18-second engine run.) A three-flight total of 21 minutes is a perfect score.

PHOTOS BY JOE BESHAR

Bill Fox competes after making the transition to R/C assist.



Here's a top view of the Playboy Sr. before covering.



Here are the on/off switches for the radio and the ignition. The battery plugs are for ignition circuit. They enable connection to a booster battery for ignition-engine start-up.

In this close-up of the tail feathers, you can see the Playboy's control surfaces.

Bill goes from modern free flight (far left) to R/C-assist (left).

determine the cabin platform's correct configuration. The front section of the fuselage is planked with the supplied 3/32-inch balsa sheeting. After planking the side, window positions are outlined with black pressure-sensitive paper to indicate the cabin configuration. The windshield consists of transparent celluloid.

The radio servos are mounted in the fuselage using 1/4x3/8-inch basswood cross-braces and connected to the control surfaces with Sullivan* Nyrod control cables. The ignition system used in this model is the same as that used in the original version, i.e., it has a high-tension coil and condenser without any modern, electronic, transistorized components. For protection against radio glitches, however, a 10,000-ohm resistor has been added to the high-tension lead. Power is provided by two AA alkaline batteries. The engine shutoff is controlled by a servo-activated microswitch in the ignition circuit. The model has a total of three servos, i.e., for the elevator, the rudder and the engine shutoff control. The entire model is covered with Coverite* Micafilm, and the engine compartment is coated with Hobbypoxy* for fuel resistance.

Upon completion, Bill had his first experience with an OT R/C-assist model at a local flying field. I stood by to help him during the excitement. During the first flight, Bill did a good job controlling the model, which climbed almost straight up. In 30 seconds, it was the size of a pinpoint—almost out of sight—and this demonstrated the plane's high-performance characteristics.

Would you believe that, after his first attempt, Bill felt confident enough to enter the '90 SAM (Society of Antique Modelers) Championship, which was held at the Westover Field in Chickopee, MA? Although he flew successfully in the competition, he found out that he needed more practice to get into the winners' circle. I believe that he has the potential.

SPECIFICATIONS

Model name: Playboy Sr.
Type: OT R/C-assist
Price: $100 (SAM member special: $69)
Wingspan: 80 inches
Wing area: 810 square inches
Wing loading: 10 ounces per square foot
Weight: 56 ounces
Length: 41.5 inches
No. channels req'd: 3 (throttle, rudder, elevator)
Radio used: Airtronics*
Power req'd: for sport glow—.25 to .28 2-stroke; for SAM competition—maximum of .35 glow up to .65 ignition
Airfoil: 1940s-type, high-lift, undercambered
Wing construction: built-up balsa with hardwood and balsa spars; polyhedral
Kit construction: built-up balsa and frame

Features: the kit comes with rolled, full-size plans; shaped leading and trailing edges; bagged, machine-cut parts for each component; jig-notched ribs; wing pegs; control horns; formed landing gear; and engine mounts. The plans show the original pylon version, but they also show the cabin modification as represented in this article. The Playboy Sr. was originally designed by Joe Elgin around 1940, and it was "kitted" by the Cleveland Model Airplane Co. The R/C-assist version sold by Balsa Products Engineering qualifies for SAM competition.

Hits

- At 3.5 pounds, the plane flies as an OTer should. It climbs well and glides slowly and predictably.
- The plans are clear, well-detailed and self-explanatory.
- All the wooden parts are neatly packed, well-machined and well-engineered.

Misses

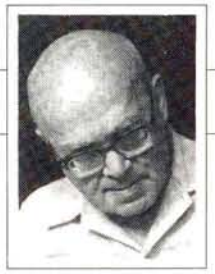
- The kit is targeted at the average builder, and it doesn't include a detailed instruction manual. The inclusion of a beginner-level instruction booklet would be helpful to novice builders.

The Super Cyclone engine is mounted for a test run. Who's giving instructions—Bill Fox (left) or Joe Beshar?

The Playboy Sr. is a fine kit, and building it is a fine experience. It was a joy for me to have been Bill's mentor. Now that he has entered the world of R/C, I'm sure you'll hear more about him.

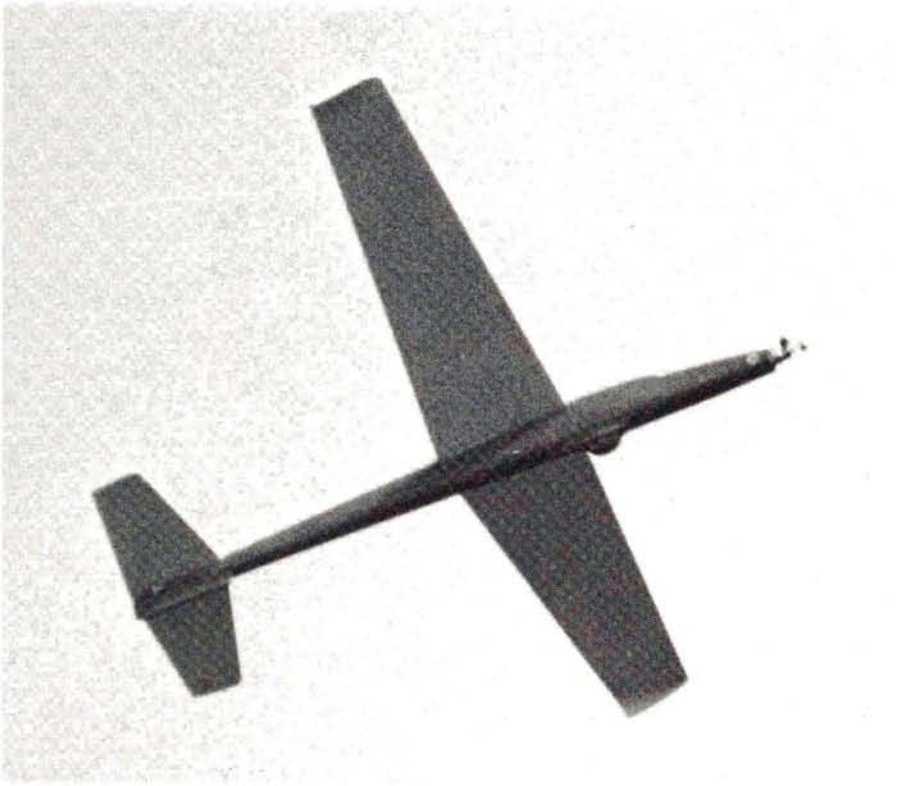
**Here are the addresses of the companies mentioned in this article:*
Balsa Products Engineering, *122 Jansen Ave., Iselin, NJ 08830.*
Sullivan Products, *1 N. Haven St., P.O. Box 5166, Baltimore, MD 21224.*
Coverite, *420 Babylon Rd., Horsham, PA 19044.*
Hobbypoxy Products, *Div. of Pettit Paint Co. Inc., 36 Pine St., Rockaway, NJ 07866.*
Airtronics Inc., *11 Autry, Irvine, CA 92718.*
Robart Mfg., *P.O. Box 1247, 310 N. 5th St., St. Charles, IL 60174.* ■

SMALL STEPS



JOE WAGNER

CONTROL DEFLECTION



Slow airplanes need more control throw than fast ones, but 15 degrees of deflection is ample for this .049-powered, 12mph "King Condor."

ONE COMMON problem with small R/C airplanes that contributes greatly to their reputation for "squirrely" flying is excessive control movement. All too frequently, modelers use short, 1/2A-size control horns on the rudder and elevators of small R/C projects because they seem more dimensionally appropriate than larger, standard ones. Often, the 1/2A horns are cut even shorter to make them appear less obtrusive on a diminutive model.

The shorter the "lever arm" a control horn has, the farther it moves angularly with a given amount of pushrod travel. Let's look at some numbers. The innermost pushrod hole in a typical small (not micro) servo output wheel has a .30-inch operating radius. The outermost hole in a Du-Bro* 1/2A horn mounted on an 1/8-inch-thick elevator or rudder has an operating radius of .72 inch. The servo moves 45 degrees either way. Thus, connecting the innermost hole of, say, Ace R/C's* Bantam Midget servo wheel to the outside hole of a stock Du-Bro 1/2A horn will produce a surface deflection of 19 degrees either way. This is just about the maximum you'd ever want or need in a properly trimmed R/C model.

If you shorten the horn to the next hole, though, the control motion goes up to 25 degrees. That's too much, especially for scale-

(Continued on page 28)

Miniaturization Requires Sophistication

It's tiny, but the .010-powered Aero-Crafted "Skoots" prototype Steve Staples holds here is no toy. It's a design engineer's triumph.*

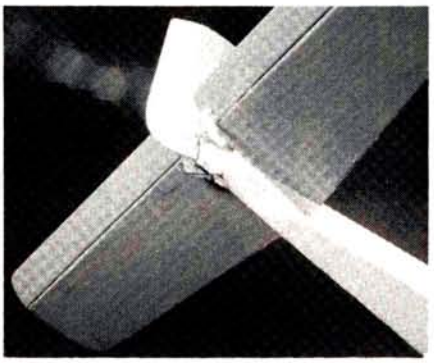
The difference between grown men and boys is readily seen in the price of their toys. Most model fliers hate it when their creative and scientific endeavors are called "toy airplanes." Maybe that's why small R/C craft are in the minority at many flying fields. To the uninitiated, miniatures appear more toy-like than larger models. Yet in terms of design and assembly procedures, it can be said that small models require a higher degree of sophistication than large models do.

Just because something's small doesn't make it a toy. Few people consider HO model railroads to be toys, yet they're much smaller than the well-known Lionel toy trains. The difference, of course, lies in the amount of creative work required. And the same holds true with model airplanes! A tiny R/C craft like Jesse Shepherd's "Skoots" represents a great deal more effort and skill than many a "Trainer .40"—ARF or not!

(Continued from page 26)

type craft with scale-size control surfaces. My Goliath* King Condor, the slowest-flying R/C model I've ever had, needs only about 15 degrees rudder and elevator motion. My faster airplanes maneuver well with even less deflection, because control-surface effect is proportional to the square of the model's air speed.

I've seen several small R/C airplanes lately with more than 30 degrees control deflection each side of neutral! Their fliers have to nudge their transmitter sticks carefully just a smidgen one way or the other if they want to maintain smooth flight. "*Gadzooks*, this thing is touchy!" cried the pilot of such a model at our club field last summer. "Cut your control motion down to about a third of what you have now," I recommended. He did, and the airplane changed from a squirrel to a pussycat.



Too much! The amount of control deflection shown here makes this model far too touchy. With half as much motion, it would be much easier to fly—and much more fun.

How much control motion do you need? The rudder of a typical light-plane-category R/C model should never require more than 18 degrees either way. Its elevators may benefit from a little "biasing" (say, 25 degrees maximum "up" to enable spinning and 15 down). The increased air speed with "down" elevator means less deflection is needed for the same effect. Narrow, "strip"-type surfaces require somewhat greater motion than scale-proportioned ones, though. About 25 percent more ought to be plenty.

Scale-type ailerons on symmetrical wings should have the same amount of "up" and "down" deflection. Wings with "lifting" airfoils work best if the "up" motion is about twice as much as the "down." Various explanations are offered for this "differential aileron" effect. The one I like best is this: as soon as a "down" aileron begins to move, it encounters smooth airflow below the wing and goes right into action. Meanwhile, the opposite "up" aileron enters turbulent, lower-density air that's flowing back from the airfoil's high point and thus can't produce nearly as much banking effect (or drag) as its down-moving partner on the other side—unless it deflects considerably farther.

Another aspect of aileron control that has to be watched is the torsional flexibility of strip-type ailerons. These are normally actuated at the root end, and if they're not stiff enough to resist twisting during flight, they'll deflect too much close to the fuselage (where their effect is minimal) and not enough farther out on the wing. That's why instructions for some model kits with strip ailerons tell you not to taper these surfaces. Doing so will reduce their torsional stiffness and thus their control effectiveness—especially at high speed, when positive control is a *must*.

**Here are the addresses of the companies mentioned in this article:*

***Du-Bro Products Inc.**, 480 Bonner Rd., Wauconda, IL 60084.*

***Ace R/C Inc.**, P.O. Box 511, Higginsville, MO 64037.*

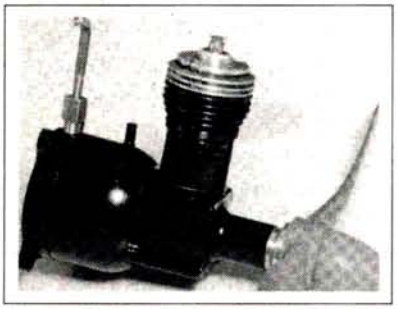
***Goliath Whirlwind Aircraft**, 2501 Williams Dr., Waterford, MI 48328.*

***Cox Hobbies Inc.**, 350 West Rincon St., Corona, CA 91720.*

***Kustom Kraftsmanship**, P.O. Box 3010, Fallbrook, CA 92028.*

***Aero-Crafted Models**, 2713 Summit View Dr., Bedford, TX 76021.* ■

REWORKED 1/2AS



Kustom Kraftsmanship's handfitted, super-tuned version of Cox's Black Widow performs at Tee Dee levels.

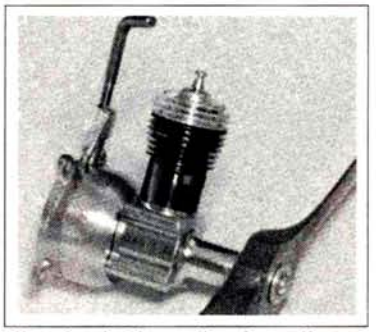
It's hard to even guess what proportion of small R/C airplanes is powered by Cox Hobbies'* reed-valve engines, but two-thirds can't be far off the mark. Cox has sold millions of these engines, among them, the Pee Wee .020 and various .049s (including the Babe Bee, the Black Widow, the Texaco and the QRC). So many of these little engines are used to power R/C models that nearly all my "Small Steps" engine mail concerns Cox products.

The main problem seems to be that, because reed-valve motors are manufactured in such large numbers, they lack the "customized" character that many R/C fliers have come to expect from their experiences with larger, costlier, designed-for-R/C engines.

There are many ways to improve stock Cox engines. I've sent out well over 100 letters to readers describing these methods, and I've featured a few in my columns, but most require precision tools and a fair amount of time to accomplish. Not everyone can tackle this sort of work.

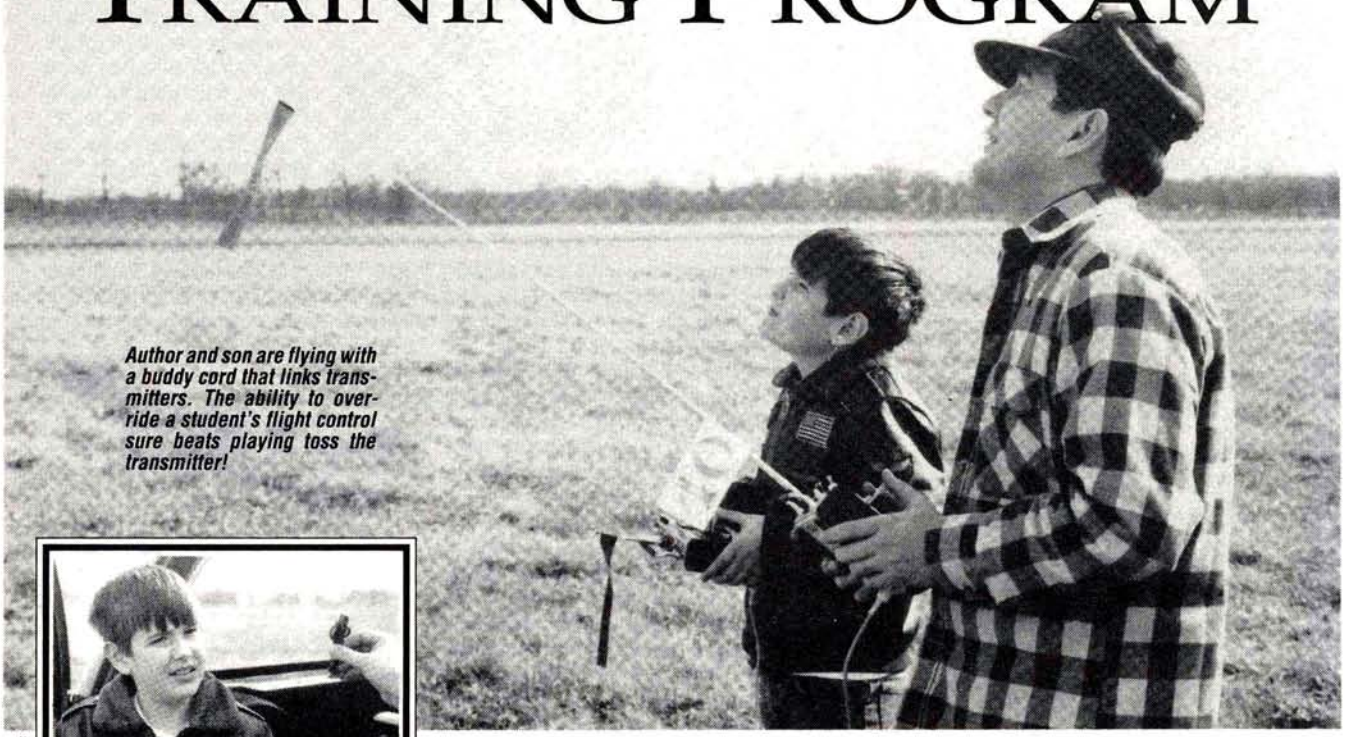
Good news: now you don't need to! Joe Klause of Kustom Kraftsmanship* sells ready-to-run customized Pee Wees and Black Widows with everything optimized for the best possible R/C performance and reliability. I have KK versions of both the .020 and .049, and they're the nicest-running Cox reed-valvers I've ever owned. They even outdo my own carefully reworked engines—something I wouldn't have thought possible until I actually tried Klause's products.

In R/C use, the Black Widows I've rebuilt outperform average stock Tee Dees of the same displacement. Joe Klause's customized Coxes do even better!



Note the airtight needle valve on Kustom Kraftsmanship's customized Pee Wee .020. It takes the frustration out of adjusting this tiny engine's fuel mixture.

A Successful Flight Training Program



Author and son are flying with a buddy cord that links transmitters. The ability to override a student's flight control sure beats playing toss the transmitter!

PHOTOS BY STEVEN E. WOODRUFF

Before a training flight, the instructor demonstrates a maneuver with a small hand-held model while coaching the student on associated transmitter stick movements.

A PLAN FOR SAFETY AND PROFICIENCY

IN LATE 1986, I moved from Seattle, WA (where I had been assigned to Boeing's Air Force Plant Representatives Office) to Los Alamos, NM. I left behind an R/C club at Boeing that had over 200 members, and I joined a new club with only a dozen members. Two-and-a-half years later, the Los Alamos R/C Aeromodelers (LA R/C A) had grown to 30 members. Though such a large increase in membership isn't unusual and is welcome in a young organization, it does create some problems. In our case, we wanted to ensure that new members received adequate training. The LA R/C A responded by putting together a full-fledged training program that should be helpful to other clubs that face the same situation.

First, we compiled a list of club members who were willing to help beginners with airplane construction and/or flight training. Then we published this list in the club's newsletter, which we handed out to new members and to prospective members. Our "help list" was only a partial success, so club leaders decided that a more comprehensive flight-training program was needed. I volunteered to put one together. (Thirteen years in the Air Force, and I still haven't learned not to raise my hand.)

To create a training program, I thought that all I'd need would be a copy of the Boeing club's training document. After further discussions with club officials (did I mention that I also volunteered to be the club's VP?), we decided to establish a training program that required much more work. We had five goals in mind:

- promote safety, not only in the air, but also on the field;
- develop competent fliers ;
- create a program that efficiently turned beginners into solo-certified R/Cers;
- provide consistency and uniformity in the training program;
- document our progress to ensure that all goals are met.

After looking at several other training programs, I decided that no one program would meet our needs. Rather than reinvent the wheel, I combined the best features of several programs into one package for students and one for instructors.

Our student flight-training book is very simple. It has only four parts, and it can be quickly and inexpensively duplicated. The instructor should make sure that each student completes the check list before his first flight. If the student makes a bad landing, he should go through the check list again before the next flight. This is a good habit to get into because it gets everyone thinking about safety before the engine is even started. Also, a preflight routine eliminates the embarrassment of the reversed aileron syndrome.

by STEVEN E. WOODRUFF

Here's what our check list looks like:

1. [ ] Elevator and rudder pushrods—no binding, rubbing or sticking
2. [ ] Motor and nose-wheel pushrods operating properly
3. [ ] Check direction and operation of throttle
4. [ ] Controls move correct distance and direction
5. [ ] Check trims for correct settings
6. [ ] Check for no play in control surfaces
7. [ ] Check for tight wheel collars, clevises, wing bolts, etc.
8. [ ] Transmitter and flight-pack batteries fully charged
9. [ ] Reliable idle and return to high throttle
10. [ ] Engine run not too lean or rich
11. [ ] Fuel feed and foaming (air bubbles in fuel line)
12. [ ] Check for control-surface flutter with engine running
13. [ ] Range-check radio
14. [ ] Transmitter antenna fully extended

You may want to change some of this, and that's OK. Keep in mind that a list of fewer than 10 items is probably inadequate and that a list with over 15 items becomes onerous, and it probably won't be used as often as it should.

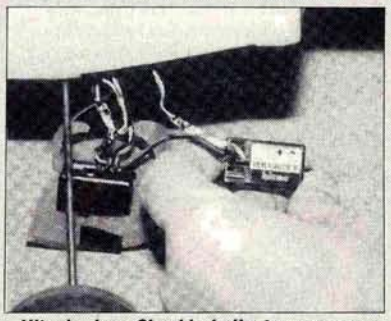
Several pages of flight-log sheets should follow the check list. On mine, I've allowed space for comments about training progress, aircraft condition, etc., and I use both sides of the sheet. My log looks like this:

CHECKING UP

The Hitec PowerMate estimates remaining flight-pack time.

by TOM ATWOOD

How to safeguard against receiver-battery-pack failure is a subject that's sure to come up when new R/Cers are being trained. Two items that can help ward off flight-pack trouble are Hitec's* Power-Mate battery tester and the Hitec Jam-Check'r. The PowerMate, which tests 4.8V or 6V flight packs, simulates a maximum load on your servos and then estimates remaining battery capacity as a percentage of time before a worst-case condition will shut down the radio. (Therefore, after a full charge, the meter will read 85 to 90 percent). In the photo, I'm checking the remaining charge on a small, 250mAh pack after nearly half an hour of accumulated flight. The dial indicator shows about a 20-percent reserve, but it's in the red (meaning a servo jam could take out my radio). Time to recharge! (The plane is a Great Planes ElectriCub that's designed for 05 electric power but converted here to fly with an O.S. .15 engine.)



Hitec's Jam Check'r indicates no overloaded servos.

In the second photo, I'm using the Jam Check'r, which diagnoses overloaded or jammed servos. A jammed servo will quickly drain a flight pack. The Check'r is connected to the flight pack and the radio. After plugging it in and turning on the radio and the transmitter, a green light (50mA, on the left) shows normal no-load power consumption. A yellow light (100mA, middle) shows normal load during servo actuation, and a red light ((250mA+) shows an overload. The green light should light up after moving a control to its extreme position and holding it there. The most common problem the unit will identify is a jammed throttle linkage at full power. The Powermate lists for $24.95, and the Jam Check'r for $14.95.

This log is fundamental to an efficient training program. Students can fly with any available instructor, and a quick look at the log will indicate which lesson is next. Instructors won't waste time with lessons that have already been given or with lessons that the student isn't ready for. Consistent use of the training log promotes smooth progression through the training objectives. Also, just as with full-scale planes, a flight log is a valuable tool in maintaining safe and airworthy planes and radio systems.

I also include a requirements' check list after the flight log so that the instructor can check off an item as the student reaches proficiency. Again, your club may want to make some changes. Just remember, the concept is what's most important. Here's what my check list looks like:

FLIGHT LOG

Flight No. ____ Date__/__/__ Time____

Log Entry: _____

Instructor Comments: _____

_____

Student Comments: _____

_____

BASIC FLIGHT REQUIREMENTS FOR STUDENTS AND NEW MEMBERS

For the safety of all club members, new pilots must qualify before solo flight. Minimum proficiency in the requirements shown must be demon-

strated to a club instructor, who will then initial the requirement. When all the requirements have been initialed, a check flight must be completed, and an instructor must sign off on it. The new pilot will then be allowed unsupervised solo flight.

1. Taxi and ground handling: show ability to control aircraft on the ground.

2. Circle around a point: climb to altitude and maintain while circling, both left and right.

3. Figure-8: maintain altitude; center crossover point at the same place.

4. Rectangle: 90-degree turns; straight and level flight; left and right turns. Traffic pattern familiarization. (Maintain enough altitude for safe recovery.)

5. Stall and stall recovery: climb to safe altitude; stall plane; resume straight and level flight.

6. Slow flight: minimum power setting; maintain altitude.

7. Takeoff: announce takeoff direction; check for other aircraft in pattern.

8. Traffic pattern: fly both left and right patterns.

9. Gliding: climb to altitude, reduce power to idle, and glide to safe height. Resume normal flight.

10. Landing: review slow flight, landing patterns; make touch-and-go's.

11. Check flight: complete all of the above, including three touch-and-go's in a single flight.

The final item in the student manual is the check flight. Two of many options are to make this the final item in the requirements' check list, or to create a separate page. Since most students train with one instructor, a different instructor should supervise the check flight. (When a full-scale student trains with an instructor, he has to be checked out by an FAA inspector—a practice that helps ensure a unbiased evaluation.) Like any other training session, the check flight should begin with a preflight check. Each item in the requirements list should then be covered. Like any regular flight, several items (which are separate training objectives) are combined and can be done that way for the check flight. In item 1, for example, taxi and ground handling are part of any takeoff, and they also figure in a touch-and-go. Level 90-degree turns are part of any proper landing pattern. A check flight should also contain two or three touch-and-go's and perhaps an emergency go-around.

Patrick "Hawk" Cummins (pointing at the Air Core power cartridge) runs the Blue Sky Soaring* flight school in Aptos, CA. Blue Sky, one of several commercial R/C flight schools, offers a course that's "designed to show the general public how to get started in model aviation in a safe and sane way." Patrick starts his students with the Ace High MK II, and he teaches more advanced flight techniques with the U.S. Air Core Trainer. He has been successful enough to make a living teaching R/C. How does Patrick organize his courses? We'll report on approaches adopted by his and other R/C schools in an upcoming issue.

The presentation of a certificate of qualification at the club meeting is a fitting end to a training program. It promotes camaraderie, informs club members who is solo-qualified, and makes a student feel good about all his hard work. In small clubs, this presentation is adequate; in larger clubs, it may be helpful to also provide a sticker for transmitters or field boxes that identifies solo-qualified members.

To round out the program, I also assembled an instructors' manual. Our flight instructors are volunteers, and although they may not need a manual, it helps to keep things uniform and efficient. For this manual, I had a good foundation on which to build. Richard Lindberg of the Santa Fe Royal City R/C Club had created a manual by adapting Don Sobbe's article "Primary Flight Training Course For Clubs," which was originally published in the '84 February and March issue of *RCM* magazine. Just what the doctor ordered, it has two parts, plus a copy of the student manual for reference. The first part (Richard's effort) consists of an introduction that states training philosophy, the goals of flight training and the functions of an instructor. It also outlines how to organize lessons, and it provides some hints for successful teaching. The second part—the lesson syllabus—outlines the 12 lessons and organizes them into four parts: purpose, objective, elements, and evaluation.

The twelve lessons are:

1. Aircraft familiarization
2. Radio and field procedures
3. Flight familiarization
4. Accuracy maneuvers
6. Orientation maneuvers
7. Stalls
8. Emergency procedures
9. Approaches to landing
10. Takeoffs
11. Solo flight
12. Further emergency procedures

Obviously, these lessons don't exactly track the ten requirements that a student must pass to be solo-certified. That's to be expected because most flight maneuvers are composed of several parts, e.g., level flight and level turns put together for a figure-8 or a traffic pattern. It's a good idea to teach stall recognition and recovery before asking a student to try sustained slow flight or landing approaches.

More than one lesson can also be combined in a training session, too. For example, aircraft familiarization, radio and field procedures and flight familiarization would probably be part of the first training session. On the other hand, other lessons (e.g., flight maneuvers and emergency procedures) will require several sessions each before the student pilot has acquired the skills to move on to the next lesson.

To complete the instructors' manual, I append a copy of the student manual to the end. I do this to remind the instructors that the goal isn't to teach a lesson but to train an R/C pilot and that completing a lesson isn't as important as preparing the student to meet the flight requirements.

I hope you'll be prompted to start a training program in your club. A good training program improves safety and club growth. The membership of my old club

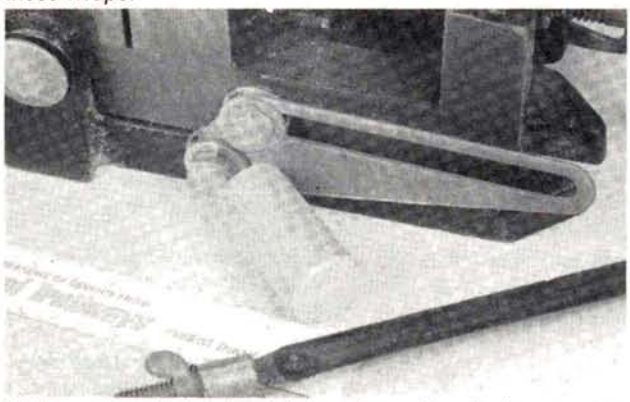
(Continued on page 72)

How To:

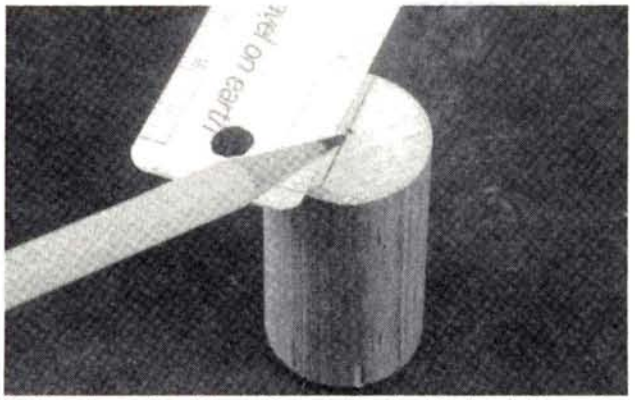
RANDY RANDOLPH

MAKE A BARREL-WRAP TOOL

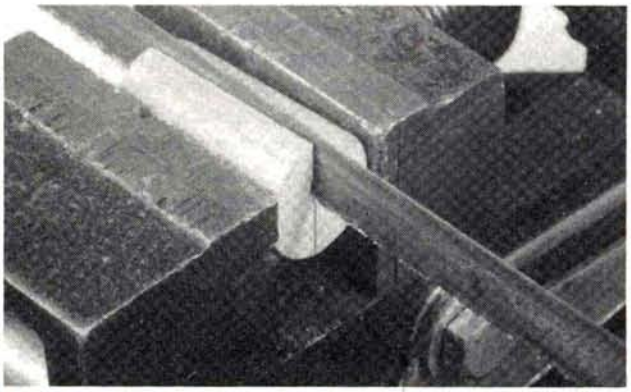
A barrel wrap, which forms an eye in the end of a piece of wire, is a popular way of attaching landing, flying and interplane wires that must be removed for transportation. The photos show you how to make a simple tool that will enable you to mass-produce these wraps.



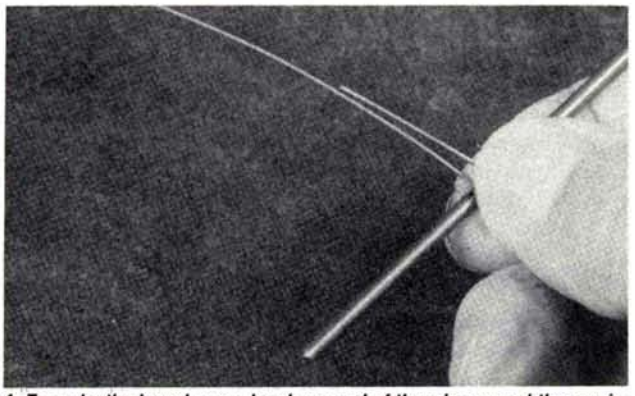
1. The necessary tools and materials: a vise; a ruler; a hacksaw or a coping saw; a 3/4- or 1-inch-diameter hardwood dowel that's 2 inches long; and a short piece of 3/16- or 1/8-inch music wire. (You'll use it as a mandrel.)



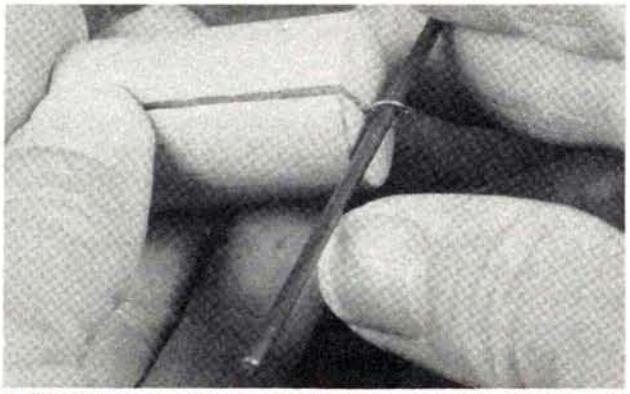
2. Determine and mark the center on both ends of the dowel. Draw a line across the diameter on one end.



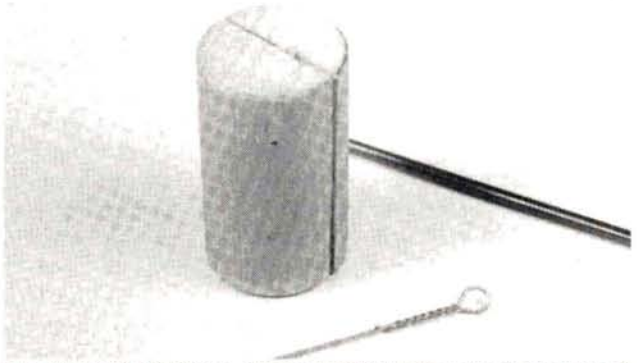
3. Secure the dowel in a vise. Using the diameter and center marks as guides, saw a deep slot (going to the center of the dowel) along its entire length.



4. To make the barrel wrap, bend one end of the wire around the music-wire mandrel so that there's an inch or more of wire beyond the bend. (You'll use the extra wire to make the wrap.)



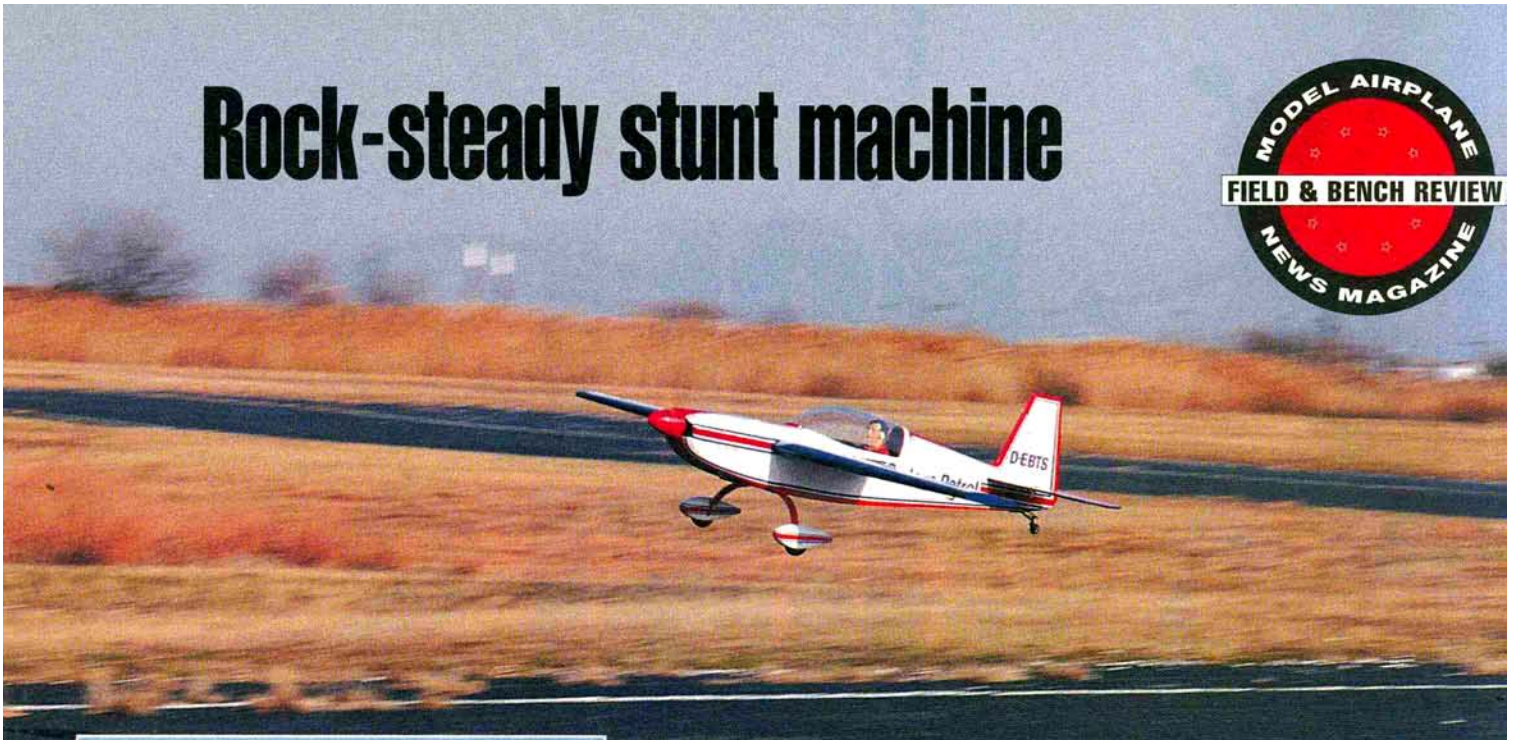
5. Slip the long part of the wire into the slot in the dowel so that the mandrel is flush against one end. Twist the mandrel to form the wrap.



6. Here's the finished wrap. You can use this tool to make barrel wraps of soft wire up to 1/32 inch in diameter.

Rock-steady stunt machine

MODEL AIRPLANE NEWS MAGAZINE
FIELD & BENCH REVIEW



Carl Goldberg Models

Extra 300

by SAL IASILLI

IN THE LAST few years, Carl Goldberg Models* has introduced some great-flying, semi-scale aerobatic models to its fleet. First came the Chipmunk, then the Ultimate Biplane and now the Extra 300.

The full-size Extra 300 was designed by Walter Extra of Germany, and only a limited number were built, making them difficult to come by. It's a two-place unlimited aerobatic airplane that's considered by many to be among the best in the world. One Extra 300 is flown by the U.S. World Aerobatic Team.

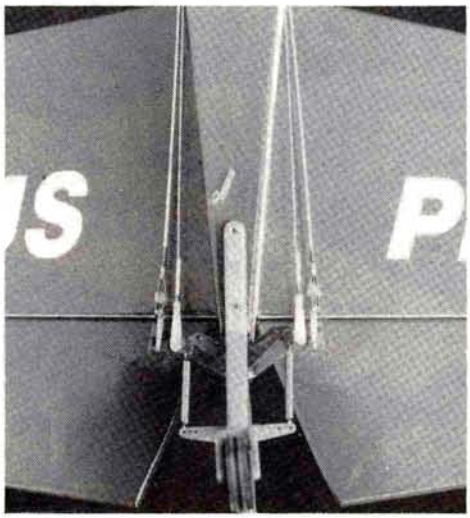
Dave Patrick of Carl Goldberg Models, himself a world-class model aerobatic pilot, designed the Extra 300 model. His intention was to have the plane resemble the full-scale 300 without sacrificing its flight performance as a model; it had to be light and strong to withstand the demands aerobatic flying imposes on the airframe. He has succeeded.

THE KIT

Included in the kit are highly detailed, full-size plans (two sheets) and "Book One"—a fully illustrated, 63-page instruction manual, each page containing a multitude of illustrations. Also included in this manual is a parts list. "Book Two," the "General Information Booklet," contains all you need to know about building a model from start to finish (very helpful for the novice). Also included is a vacu-formed cowl, wheel pants and canopy, glass-filled nylon engine mount, $^{3}/_{16}$-inch wire landing

PHOTOS BY SAL IASILLI

Extra 300



Bottom shot of stab and rudder showing double pushrods to elevator, two-cable pull/pull rudder system and scale tailwheel assembly. Tube on fuselage at base of tailwheel assembly is for antenna wire.

gear, complete hardware package and two small sheets of Mylar decals. The selection of wood parts was very good. Fuselage parts are of die-cut lite-ply, whereas the wing ribs and sheeting are of 1/16-inch balsa. Balsa for the stab and rudder is also of good quality.

CONSTRUCTION

Following the manual, I started with the construction of the stabilizer, which is basically an open frame consisting of 3/16x 5/16-inch balsa and 1/16-inch sheeting. I constructed the rudder and fin in basically the same way. The hinge line on the elevator and rudder requires a beveled edge. The kit includes a three-piece plywood tool to which I attached medium sandpaper, and this allowed me to sand in the exact bevel that's shown on the plans (a very ingenious idea). A center-line tool is also very helpful when aligning the hinges. A rounding tool consisting of four pieces of lite-ply, is used to round the perimeter of the fin/rudder and the elevator/stab. It works very well.

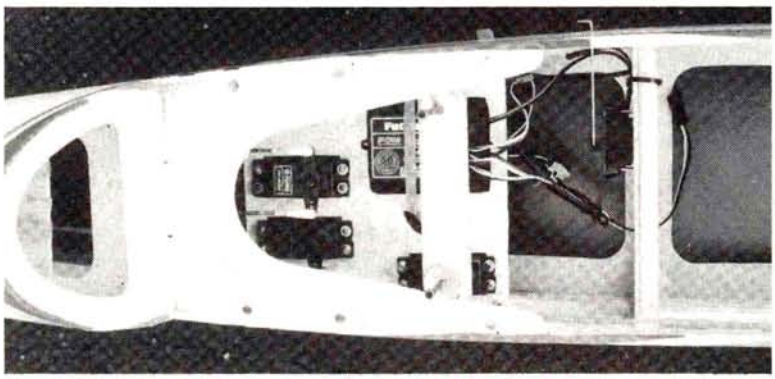
The author with his Goldberg Extra 300.

Building the wing panels is relatively simple. Each panel has three aligning ribs that all have tabs on the lower part. Once I had aligned these and the lower basswood spar with the plans on the building board and positioned the leading edge, the remaining ribs and trailing edge. I applied Superjet to all the joints. Once this had been completed, I installed the upper basswood spar and the 1/16-inch shear webbing. This was followed by the 1/16-inch leading- and trailing-edge balsa sheeting and the 1/16x1/8-inch balsa capstrips. All this was done with the wing pinned to the building board.

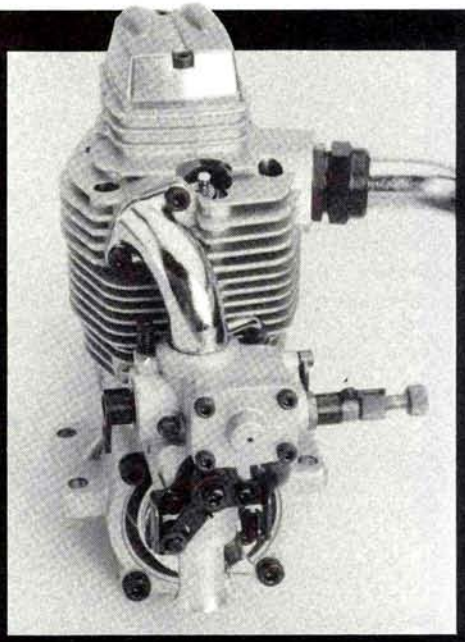
The instruction manual shows a unique way of aligning the two wing panels. It consists of two tip fixtures and two center fixtures (included in the kit)—all made of lite-ply. This is basically a wing saddle in which the wing sits inverted, and it's used to align the two panels. This is a very important procedure since, if it isn't done correctly, it will affect performance.

The instruction manual clearly states that, with the use of anything more powerful than a .60 engine, two wing servos are a must, and this is the route I followed. The manual also discusses single servo installation.

The ailerons are of solid, shaped balsa. You must bevel the aileron leading edge using



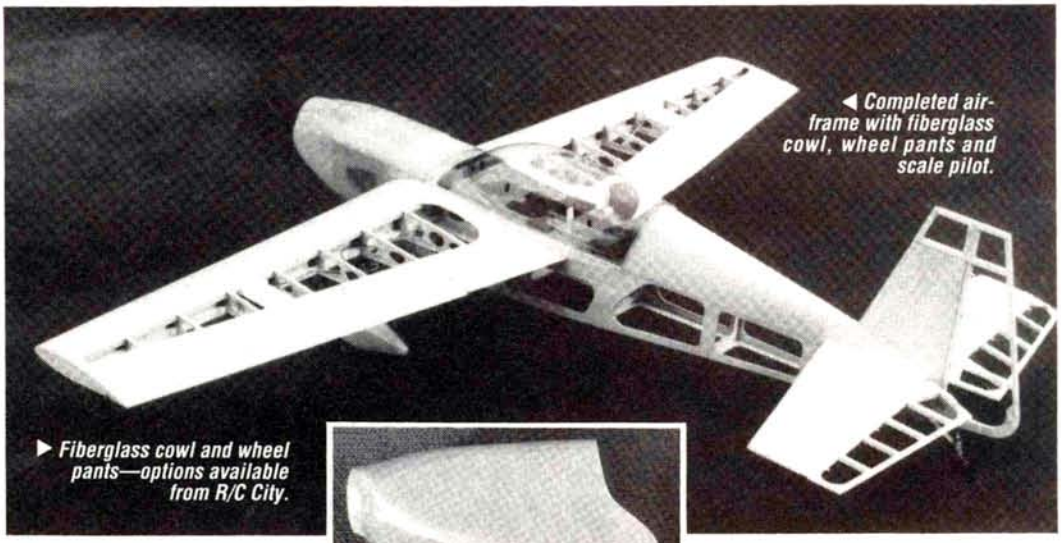
Servos, receiver and switch harness had to be moved one bay back to the "slant" former for proper balancing. Battery pack is up on the turtle-deck shelf.



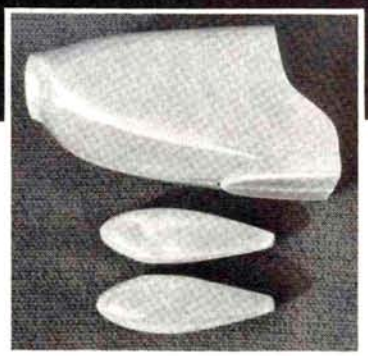
O.S. FS-120 SURPASS II

The FS-120 SII is equipped with the new C13 carburetor and PG-03 geared pump, which was developed specifically for the FS-120 SII. This new pump system provides stable power and throttle response at all times, regardless of fuel-tank location or aircraft attitude. The FS-120 SII runs on commercially available model glow fuel. Fuels containing castor oil or synthetic lubricants are acceptable. For long engine life, it's recommended that a high-quality fuel containing at least 18 percent lubricant be used. I found the engine easy to start, with excellent throttle response.

Extra 300



◀ *Completed airframe with fiberglass cowl, wheel pants and scale pilot.*



▶ *Fiberglass cowl and wheel pants—options available from R/C City.*

SPECIFICATIONS

Model name: Extra 300
Manufacturer: Carl Goldberg Models Inc.
Type: Sporty-scale aerobatic
List price: $209.99
Wingspan: 68 inches
Wing area: 850 square inches
Weight: 7 1/2 to 8 1/2 pounds (reviewed model: 9 pounds)
Wing loading: 24.39 ounces per square foot
Length: 61 inches
Engine used: O.S. FS-120 Surpass II
Power req'd: 2-stroke .60 to.90 4-stroke .90 to1.20
No. of channels req'd: 4 (rudder, elevator, aileron, throttle)
Radio used: Futaba PCM 8-channel
Prop used: Top Flite* Super-M 15x8
Airfoil type: Symmetrical
Wing construction: Built up
Kit construction: Lite-ply and balsa
Optional accessories: Scale pilot, scale tail-wheel assembly

Features: the kit contains a 63-page instruction manual, two full-size plan sheets, a general information booklet, vacu-formed cowl, wheel pants and canopy; a glass-filled nylon engine mount; a complete hardware package and Mylar decals. A complete set of interlocking die-cut lite-ply and balsa parts is included.

Hits

- Flight performance was exceptional.
- The kit goes together very rapidly; the quality of the wood is high and the parts fit is excellent.
- Plans were nicely illustrated; a thorough instruction manual is complemented by a general booklet for novice builders.
- Vacu-formed parts are of high quality.

Misses

- Instruction manual incorrectly illustrated aileron-servo installation.
- The lower panel of the fuselage below the stabilizer is approximately 1/4 inch deeper than the plan shows (the plan is correct), so the rudder had to be raised by adding 1/4 inch to its base to compensate for the error.

the aileron sanding jig. On page 36 of the manual on which the installation of the aileron servos is described, there's an error that I didn't catch until I had completed the plane. The drawing shows the servo and the hatch canted inward; as a result, the aileron pushrod won't be perpendicular to the hinge line. The plans show the correct positioning of the pushrod—90 degrees to the aileron center line. I've flown with the incorrect positioning, but I felt it unduly stressed the servos and have corrected it.

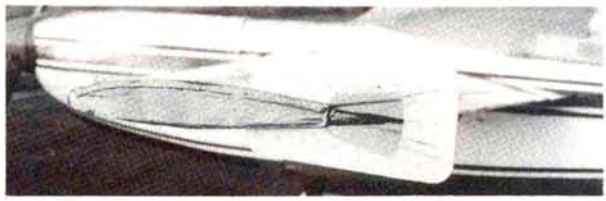
The fuselage construction starts with the alignment of the engine mount with the fire wall, followed by the installation of four 6-32 blind nuts. The engine mount is designed specifically for a .60 engine. To accommodate the powerful O.S.* FS-120 Surpass II with the pump, I epoxied 1/8-inch aircraft-ply gussets to the inside corners of the top and bottom sides of each engine T-mount. I drilled and tapped each plywood gusset to accept three machine screws. The mount is strong, light and firm.

The complete fuselage is made up entirely of lite-ply and goes together like a puzzle. Fuse panels, bulkheads and a center keel behind the turtledeck bulkhead interlock. It's recommended that rubber bands and tape hold everything in place while Superjet is applied to every seam and joint.

On the front of the fuselage, from the gear mount forward, I reinforced all joints with epoxy to increase strength. Once this had been completed, I installed the wing mounting blocks. This was followed by alignment of the wing to the fuselage. Follow this procedure exactly as described in the manual.

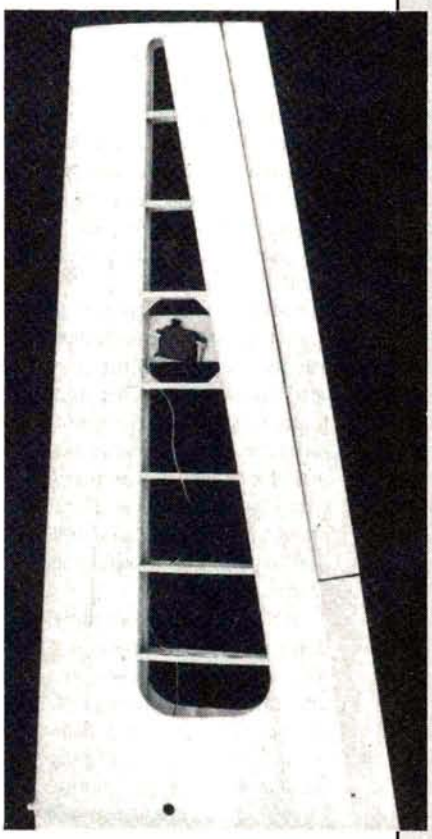
The stabilizer and vertical fin were then aligned and installed exactly as shown in the manual. In my kit, the fuse side panels below the stabilizer was approximately 1/4 inch deeper than the plans show, so I had to increase the height of the rudder by adding 1/4 inch to its base.

Then I installed the 1/32-inch ply turtle deck. From Carl Goldberg's Ed White, I recently learned of a way to form it. He recommends that when you first get the kit, you roll the 1/32-inch ply into a tube, and leave it like that until just before installation. He assures me that the proper contour will be achieved.



▲ *Attached to the wing is the aileron-deflection gauge that's used to adjust throw. It's included in the kit.*

The vacu-formed-plastic wheel pants and the cowl require that the two halves be joined, glued and filled at the seams. Mentioned in the instruction manual is the availability of a fiberglass cowl and wheel pants from R/C City*. Although the kit's vacu-formed pants and cowl seemed adequate, the exceptional quality of these fiberglass parts makes them well worth the additional cost (approximately $25 for the cowl and $30 for the wheel pants).



▲ *Detailed photo of the completed wing and internally mounted servo.*

Aligning the cowl with the fuselage, engine and spinner is tricky because the engine requires 3 to 4 degrees of right thrust. I cut out the cowl to accommodate the O.S. 120 engine and muffler. This was a little time-consuming since there's no room for error in this alignment.

The compartment for the fuel tank is rather small. Shown on the plans is

(Continued on page 72)

FLIGHT PERFORMANCE

Included in the kit is a plywood gauge that allows precise adjustment of the throws on the rudder and elevator. There are moderate to aerobatic settings (I chose moderate settings on the first flight).

Since my FS-120 engine was brand-new, it required several tankfuls of running on the ground prior to flight. At first, the needle-valve setting was extremely sensitive to adjustment. After the third tank, the adjustment was much more stable and I was ready.

• Takeoff and Landing

There was a slight crosswind, but not enough to postpone the first flight. I kept in mind Dave Patrick's advice on first flights: while taxiing, always use full up-elevator because the plane has a tendency to nose-over. While taxiing, I accidentally relaxed the up-elevator, and the tail momentarily came up, almost nosing-over.

I gradually advanced the throttle, and the Extra started to track beautifully and gained speed. At half throttle, it was airborne. At full throttle, the O.S. came to life, as did the Extra. No trim adjustments were necessary. The response so far had been extremely accurate and stable. I did a few circles around the field and throttled back to check the glide rate and throttle response, since this was a new engine. The O.S. throttled back to a whisper as I made my landing approach. The Extra seemed literally to float as stably and slowly as a trainer without any tendency to tip stall (surprising for a high-performance airplane). This resulted in a perfect three-point landing in the spot from which it had taken off. I then taxied off the flight line, again holding full up-elevator, to re-check the airframe before starting a second takeoff.

In one landing, I decided to land with a side slip to compensate for a crosswind. Again, the Extra glided in ever so gently to a beautiful, feather-soft landing.

• High-Speed Performance

The plane required essentially no trim changes between low- and high-speed flight. No flutter has been encountered. In flight tests involving full-throttle, full-deflection loops, the review plane hasn't shown any tendency to snap out of a high-G turn.

• Slow-Speed Performance

In very slow flight, the Extra tends to "mush" forward but doesn't fall off at either wing tip. In a dead-stick landing, the Extra has an excellent glide rate that isn't fast, unlike those of most high-performance aerobatic planes. It seemed to glide just a little faster than when on low throttle.

• Aerobatics

On my second flight, I went almost immediately from low to high throttle, and the Extra climbed out like a full-scale aerobatic plane. I tried some axial rolls—three to the right and three to the left. From one end of the field to the other, the rolls were crisp and precise and the Extra 300 remained right on heading. I'm glad I followed Dave Patrick's advice on using exponential on the ailerons, since they're so responsive to any movement on the stick. Exponential is a must for flying straight and level. The starting point is 25 percent, and it's adjusted from there. "EXPO softens the neutral."

I then flew to the end of the field and went into a graceful split-S to level flight, followed by a quarter roll to the left holding full-right rudder. The Extra went into a perfect knife-edge from one end of the field to the other, and I added a little opposite aileron to keep the wings perfectly vertical.

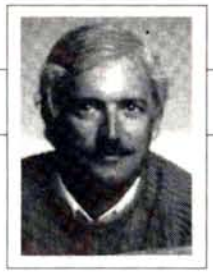
Next was the vertical-performance testing. After a high-speed flyby, I did vertical four-point rolls—outstanding. When I achieved the desired height, I tried a hammerhead turn by easing back on the throttle, kicking in right rudder and giving a slight burst of throttle to get over the top and down. On the downward leg of the hammerhead maneuver, I performed outside and inside snap rolls that were instantaneous and predictable, and I still maintained my downward heading.

Later, at a nearby, town-owned aerodrome, I was fortunate enough to run into one of the best fliers on Long Island—a young fellow named Yuri Higuchi. He was more than glad to have the chance to fly the Extra. When Yuri was ready to fly, most of the other flying came to a halt because everyone knew they were in for an exciting demonstration.

One of the first maneuvers I requested was a low knife-edge flyby. He obliged by flying only inches off the runway—unbelievable! He then climbed out inverted. Another flyby, also close to the ground, was inverted and as steady as a rock. His other maneuvers included beautiful rolling circles (very low around the field), snap rolls (inside and out), stall turns and Cuban-8s.

What impressed him most was the Extra's stability in inverted flight, virtually hands-off with no down-elevator required. When I asked him about the way I had set up my control throws, the balance point and the selection of a 15x8 prop, he said these were a perfect match for this aircraft and told me not to change anything. This was nice to hear from an expert flier.

AEROBATICS MADE EASY



DAVE PATRICK

FAI WINNERS AND THE STALL TURN

BEFORE I talk about flying tips, I want to mention the '91-'92 World Championships in Australia. Austria's Hanno Prettner, who dominated the World Cup for many years, ended up 5th, which was quite a surprise. The big news is that America's Chip Hyde is now *the* new world champion. The World Team trophy went to the Canadian team, of which I'm a very proud member. In the past, Team USA has won almost every time and, until now, the best that Canada had placed was 3rd. This year, the battle was very close: out of almost 9,000 points, Team Canada won by a slim margin of only four points.

Competition does breed innovation and development, and this year was no exception. Of interest to me was the popularity of the 120 4-stroke—particularly the YS, which is quickly becoming the powerplant of choice. Larger-diameter props with lots of pitch and fuel with 20 percent or more nitro were also the rule. For example, Dave von Linsowe flew his YS 120-powered "Mistross," which has over 1,100 square inches. He was turning an APC 15x12 at about 8,500rpm with 25 percent Powermaster* fuel, and at 10 pounds, it flew very well.

Linsowe's plane, which was probably the largest one there, is indicative of the direction that F3A (an aerobatic power competition class) is taking. In the long run, what happens in F3A will affect what we all do in aerobatics. Don't get me wrong; I still think a good 2-stroke airplane will remain very competitive (Chip Hyde won the world title with a 2-stroke). I'm seriously looking at the 4-stroke, however, and I've already outlined my latest pattern design (the "Finesse"), which is designed specifically for the new YS 120 and the new maneuvers in FAI pattern.

PERFORMING THE STALL TURN

The stall turn is one of those deceptive maneuvers that seems easy, yet can be difficult to do consistently well. It's a "timing" maneuver that requires plenty of practice. Let's walk through one. First, you must pull up into a vertical attitude. The rate of pull (or radius of the pull-up) should be constant. I prefer the radius to be about the same as it is for a regular loop.

This isn't as simple as it sounds. For example, the wings must be level when you start. If your left wing is 10 degrees low when you start to pull up, the vertical line defined by the plane's flight will also be 10 degrees tilted to the left. If you must correct (and you almost always have to), use aileron only during the initial pull-up (about one-eighth of the entry into a loop). After that, use the rudder to straighten out your vertical line. Rudder skills are very important for good aerobatics.

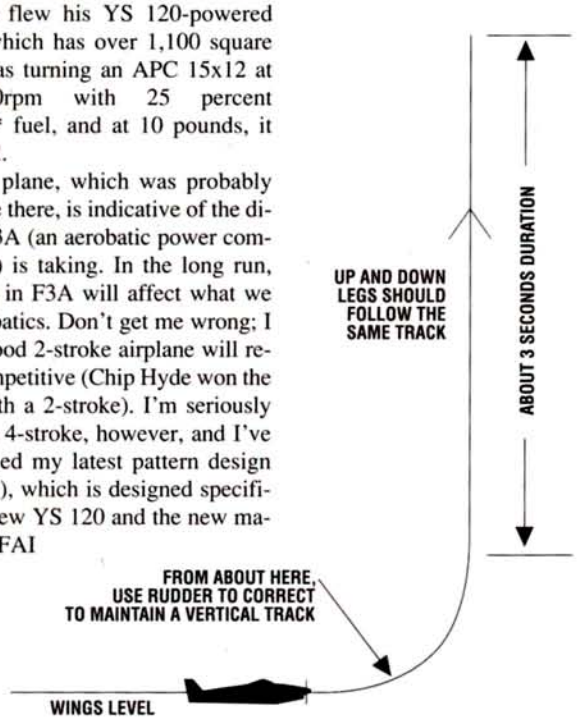
Once you've established a perfect vertical line, you can throttle back. But wait; don't throttle all the way back. Keep your power on so that you maintain about 3,500 to 5,000rpm. This ensures rudder authority, and it slows your rate of deceleration, which gives you more time for rudder input. Just before the plane stops, add the rudder (not too fast), and always stall into the wind. If the wind is coming from the right side of the aircraft, use right rudder input to make the turn or the rotation much easier.

As the plane rotates, reduce power to idle. Near the completion of the stall turn, reduce right rudder, but keep some in—about one-quarter to one-third. This right rudder helps to prevent the tail from oscillating during recovery. Slowly remove rudder so that only you knew it was there. As viewed from the side, the pull-out should be on the same line and have the same radius as your pull-up.

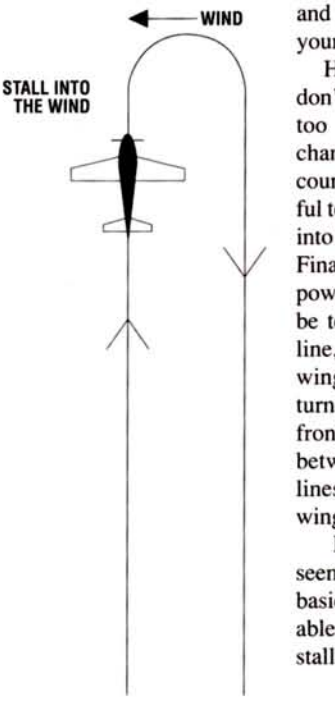
Here are some more hints: don't make your vertical line too tall; it increases the chances of wandering off course. Sometimes, it's helpful to "lean" the plane slightly into the wind, but just a little. Finally, if you keep too much power on, the down line will be too far away from the up line, and you'll be doing a wing-over instead of a stall turn. As viewed from the front, the lateral distance between the up and down lines shouldn't exceed one wingspan.

It's not as simple as it seems, but if you follow this basic formula, you should be able to improve your rudder stall turns. When you learn a

(Continued on page 77)



STALL TURN SIDE VIEW



STALL TURN FRONT VIEW

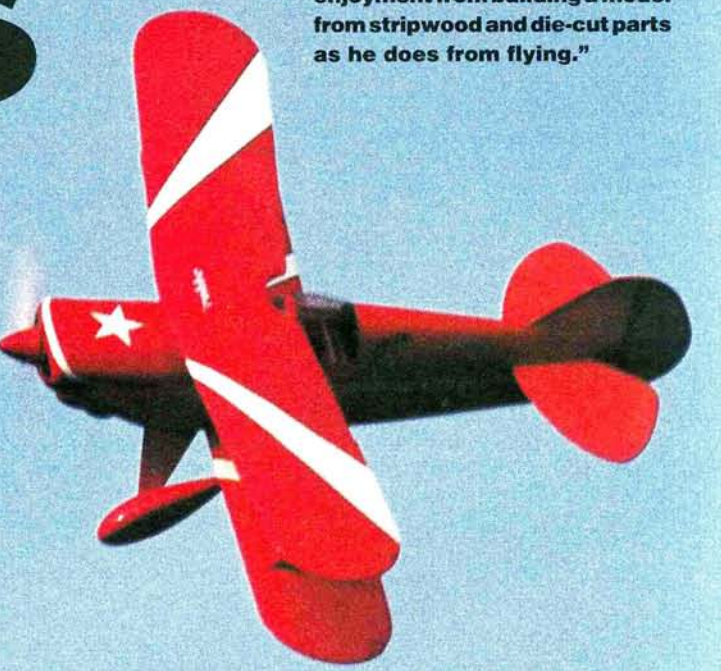
I'VE ADMIRED the Pitts Special ever since I saw the Ray-Ban Gold aerobatic team fly it several years ago. About two years ago, I noticed an uncovered electric version of the Robbe* Pitts at the WRAM Show. The design was more intricate, and the light structure that resulted seemed worth the effort.

As you might imagine, when I was asked to review the Pitts Special, I eagerly accepted. Before I begin, though, let me advise you that this is far from being an entry-level kit. It contains several stripwood packs and more than the average number of die-cut sheets. Here are some quotes from Robbe's catalogue: "Considerable building experience is needed; the model takes a substantial time to build...the model is ideally suited to the skilled modeler who gains as much enjoyment from building a model from stripwood and die-cut parts as he does from flying."

ROBBE PITTS S1

SILENT AIR SHOW

by BOB RUMSEY



PHOTOS BY TOM ATWOOD & BOB RUMSEY

SPECIFICATIONS

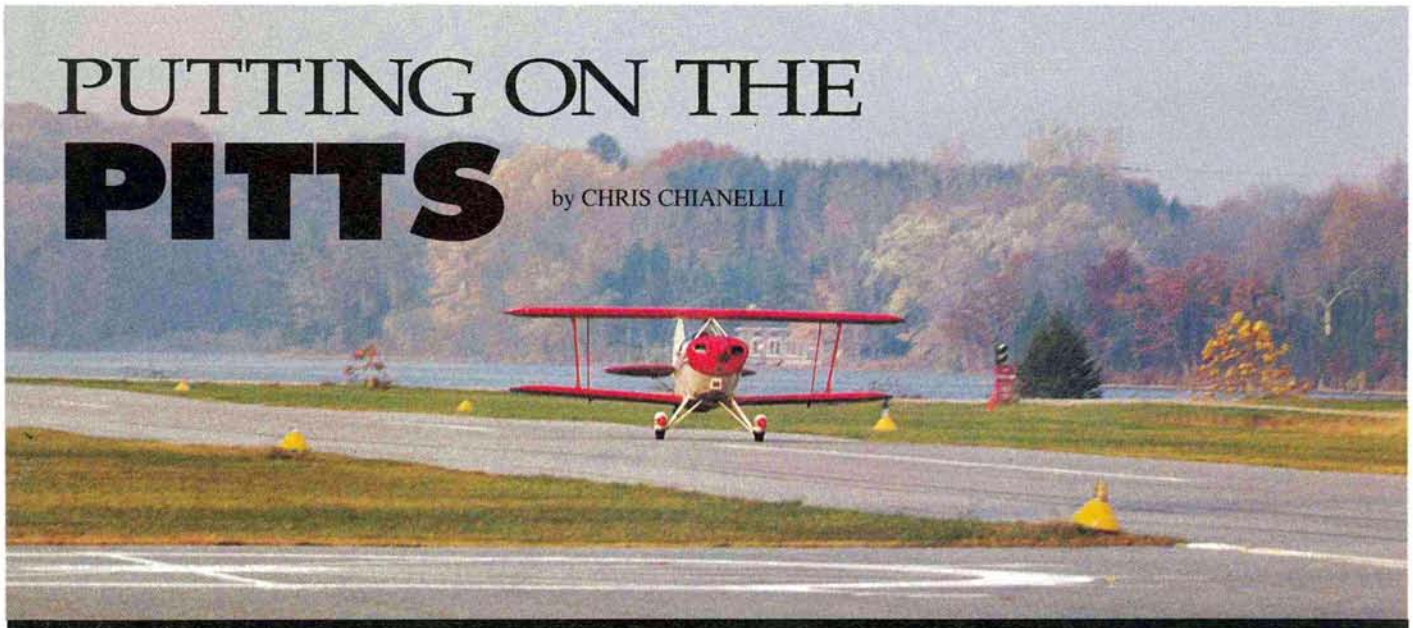
Type: Scale electric
Wingspan: 35.5 inches (top); 37.8 inches (bottom)
Length: 34 inches
Weight: 63 ounces w/Keller motor and 10 1400mAh cells
Wing area: 524 square inches
No. of channels req'd: 4 (rudder, aileron, elevator and throttle)
Airfoil: Flat-bottom with Phillips entry
Wing construction: Built-up D-tube
Kit construction: Built-up, stick
Catalogue no: 3198 (Robbe)
Washout built-in? No
Motor used: Keller 25-10 neodyme (optional)
Motor suggested: Robbe 540 S geared ferrite
Prop used: Rev-Up* 11x8
Price: $199.95
Features: Vacu-formed canopy, cowl, chin plate, gear cover and wheel pants. Upper- wing cabane supports and landing gear are pre-bent. Extensive hardware, Sullivan "Skylite" wheels and limited, but nice, pressure-sensitive decals. Geared ferrite motor.

Hits
- Beautifully finished product with extensive weight-saving construction
- Many innovative design features
- Can be adapted easily to many different motor combinations
- Good, mild aerobatic performance with motor tested

Misses
- Directions were difficult to follow, although interpreting them is easier with four large plan sheets and several isometric drawings
- Shock-absorbing landing gear presents some ground-handling problems on concrete.

PUTTING ON THE PITTS

by CHRIS CHIANELLI



Some time ago, I asked full-scale and R/C pilot Budd Davisson which are more difficult to fly—models or full-scale planes? I shouldn't have been surprised with his modest answer: "If full-scale presented the piloting challenge that R/C flying does, aviation would have been a dead issue in 1910. Come fly my Pitts, Chris, and see for yourself." To fully appreciate this offer, you should first know that Budd commands enormous respect in full-scale circles—and with good reason.

It's easy for Budd to pass off his achievements—a one-man photo show in the Smithsonian Institution ('82 to '90) and invitations from NASA to give lectures—but he has trouble making light of another type of invitation. Famous, very rich figures in full-scale aviation have often been heard to ask him: "Do me a favor Budd; please fly my priceless Mustang, or Bearcat, or Spitfire." Not only has Budd flown all three—and hundreds of other collectibles—but he also holds ratings on such machines as the P-38 and B-25! When invited to sit in the front cockpit of Budd's pride and joy Pitts S-2A, I was awestruck.

With fears and parachutes neatly folded and tucked away, there I was at the end of the runway having my apprehension turned to exhilaration by a magneto/engine run-up final check. It might sound strange, but only on takeoff did I remember why I was doing this: to compare full-scale planes with models. Whenever I forgot, a quick look out over the seven or so feet I could see of each lower wing half reminded me; those protrusions seemed to be no more than big red-and-white butter knives stabbing the sky for lift and stability.

The Pitts really felt like a "full-scale," 1,100-pound, high-powered model. In what seemed like seconds, we were at 4,000 feet, and Budd's deadpan voice came over the head-set: "It's yours, Chianelli. Try not to wreck it." I instantly gave it full throttle, pulled vertical and couldn't decide whether to do a Lomcevak or a powered roll; so I did both at once—in my dreams, the night before! Actually, I took a real-time "inventory" to see whether this was really happening by slowly rotating the stick around neutral point, and the Pitts oscillated around its center, stopping the instant I did. It's so crisp that it reads your mind like the Pitts models I've flown.

During turns, I noticed the Pitts stayed exactly where it was pointed until told to do something else. Budd told me R/C pilots have an advantage when doing full-scale aerobatics because we "see" what the airplane will be doing; we think ahead. It's true that, while doing loops and rolls, I visualized from the "outside" what the plane was doing and would be doing—just from the habit that comes with R/C experience. This not only helped me keep things straight with the flying, but it also helped me keep detached from the wild new input my body was receiving. Had I dwelled on *that*, the Pitts might have landed with a third—non-matching!—color added to its scheme.

Budd Davisson (left) Chris Chianelli (right) and Pitts student Bill Getter in the background.

Budd said good R/C pilots are almost always "naturals." I must admit that my favorite part was diving—till I found myself reading about 175 knots (about 200mph) on the gauge. I'd lift one side of the headset away from my ear to hear the diving whistle that's "endemic" to fast-falling aircraft; I was the Stuka pilot! Budd took the controls, rolled inverted and let me hang in the straps for a few seconds, telling me I was a cheap date.

Back on the ground, I vividly remembered how the stick felt exactly like a huge transmitter gimbal; it simply required a lot more muscle. The rudder is a different story, but we R/Cers don't fly with our feet. Budd honestly declared that his R/C flying has actually improved his aerobatic ability in full-scale planes. I sincerely thank Budd for an amazing experience—one I'll take to the grave.

But wait! Budd did say something that bothered me. In one respect, he prefers control-line to R/C. "It's easier to find the wreck," he confesses. "I often reduce R/C airplanes to molecular makeup on first flights." Is it possible he'll need instruction from me!?

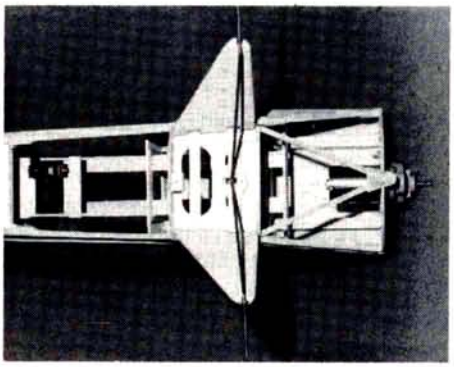
PITTS S1

As I progressed with the construction, I decided that these quotations were somewhat overstated. Although I'd still caution those who have only one or two kits to their credit, this model is well within the capabilities of most intermediate builders. The four large sheets of plans and several isometric drawings make the instructions much easier to understand. Because of the large number of die-cut parts, I strongly suggest that you first identify each part using an alphanumeric scheme. Reading through the instructions can be difficult at best, unless you refer to the drawings and identify the parts. If it's any consolation, the instructions do come in six languages.

CONSTRUCTION

Because of the lengthy instructions, I'll review those areas where I experienced difficulty, or that I changed for various reasons.

•**Wings.** I was impressed that the ailerons were cut out of the finished wings; it made an ideal fit. The wing tips, although somewhat complicated to build, are strong and durable, and they have an aesthetic appeal. Overall, the wing construction is straightforward, and the structure has plenty of strength. The pre-bent cabane wire guarantees the correct wing position and incidence.



The underside of the fuselage before the pre-formed ABS cowl, chin plate and gear cover have been attached.

The wing-rib sheets showed dramatic differences in the quality of the die-cutting. Since the sheets are identical and are cut with the same blade, I assumed that the wood was at fault. I examined the grain of each sheet and determined that it was probably the varying moisture content of different sheets that caused some "die crunching." Careful cutting where necessary and some additional sanding solved most of the problem.

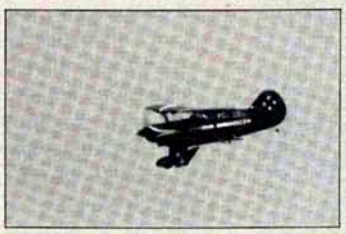
I also have some advice regarding the torque-tube assembly that's used to drive the ailerons onto the bottom wing. A hollow fiber tube is used to actuate the bottom ailerons, which, in turn, drive the upper wing set. The instructions tell you to punch holes in the lower wing ribs with a small aluminum tube that's sharpened at one end. Each rib to be punched is partially die-

FLIGHT PERFORMANCE

The initial flight took place at a grass field. I removed the wheel pants and, since I prefer to use as much power as possible for the first flight, I used the Keller motor and ten 1400mAh SCRs. Drawing 25 amps, the power worked out to approximately 62 watts per pound and provided some margin if needed.

• Takeoff and landing

With the Keller turning about 7600rpm on a Rev-Up 11½x7 prop, I let the Pitts gain as much speed as possible before rotation. As soon as it broke ground, I sensed that something was amiss. My suspicions were confirmed as the Pitts gained altitude and the downwind turn was made. Evidently, I had set the CG too far aft, since the plane was literally leaning back on its tail. I give credit to the plane's design because even though it always felt as if it was on the verge of a snap, the Pitts remained in control at all times. Suffice it to say that on the first flights, no aerobatics were tried!



Later on, in the shop, I discovered my error. Because the Pitts is a very short-coupled design with the batteries located almost at the CG, I had to make significant changes in the battery location to accomplish only modest changes in the CG position. The CG was clearly indicated. What I had thought was a nose-down attitude was merely level. I had to move the battery pack forward by 2 more inches (there's plenty of room to do this) to get the CG where it should have been to begin with. Subsequent flights were much more enjoyable, and the Pitts proved to be very aerobatic.

If you fly from a paved runway, you'll also find that the Pitts can be a real handful. It seems that the unique shock-absorbing gear allows the entire plane to lean from side to side, and this translates into some interesting ground-handling characteristics, especially when torque steering begins to take effect. Even after I had tightened the landing-gear assembly, I still struggled to hold a straight line on the paved runway. This doesn't occur when you fly from a grass field.

• High-speed performance

Even with the inherent drag of a biplane, this plane likes to fly fast. For subsequent flights, I used a Rev-Up 11x8 for more speed. I didn't notice any significant trim changes when I made the transition from low- to high-speed flight. The Germans believe that electrics fly best with a thin airfoil (I've never seen them recommend over a 12-percent airfoil). The Pitts airfoil is, at best, an 8- to 10-percent airfoil; therefore, the plane needs air speed. The thin airfoil offsets drag, and the prop and motor combination unload and reduce amp draw for a longer flight. At full throttle, the Keller motor with 1400mAh SCRs and an 11x8 prop provided a flight of at least 3.5 to 4 minutes.

• Low-speed performance

Keep a lot of power on the plane at all times; it won't maintain altitude at half throttle. The biplane's drag is apparent when you come off the power, since the Pitts slows down quickly and has a brisk descent rate. If you're unable to carry power on your final because of low batteries, keep the nose down and your speed up until you flare for touchdown.

• Aerobatics

The flat-bottom airfoil requires a lot of down-elevator (at least one-third down) for inverted flight, but that's what I expected. Rolls are slow (they tend to be more barrel-shaped), and snaps are fast. As long as snaps are performed at a safe flying speed, exits are very quick and require no cross control. The airplane loops easily from level flight at full power. Immelmanns, Cuban-8s, and reverse and standard split S's are very easy. Stall turns are a little sluggish, unless you carry at least half throttle through at the top. Hammerheads are easy. I didn't try any spins!

This plane requires a coordinated turn, as it has a tendency to display adverse yaw without rudder. This is inherent in any plane that has four ailerons and as little wing as the Pitts. To address this, I mixed in 50-percent rudder with full aileron deflection. To make the plane more responsive at slow speed, I also increased the aileron throw beyond what was recommended. Though aileron throws of 10mm up and 6mm down are recommended, I finally arrived at about 14mm up and 8mm down. The differential is built in, according to the directions.

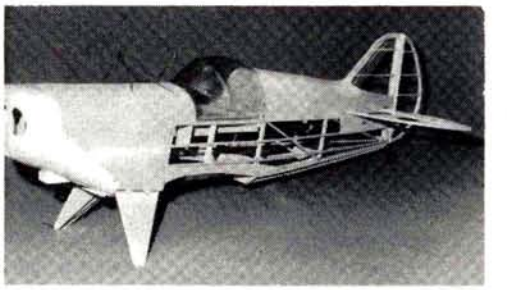
My next step will be to test the Pitts with an Astro* FAI 15 motor, which, like the Keller, runs on 10 cells. This would add power for enhanced aerobatic flight through the efficiency of its geared drive. Bench tests of the FAI 15 show that the motor will draw 25 amps spinning an 11x6 prop, or 35 to 40 amps spinning an 11x8 prop. This yields approximately 100 watts per pound and a projected flight duration of 2 to 2½ minutes.

[Editor's note: Robbe offers at least six different Keller motors for various power configurations for the Pitts S1. All are direct drive. Of these motors, the Keller 25/8 spinning an 11x8 or 12x6 prop on 10 cells would provide the greatest power-to-weight ratio. It should provide excellent aerobatic performance with a flying time of approximately 2.5 minutes.]

PITTS S1

cut to facilitate the punching. The holes in the wing ribs aren't really cut, however; it's just compressed. When the sharpened tube is used, the compressed wood merely tears and leaves a ragged, irregular hole. Use an X-Acto knife to cut the holes instead.

I replaced the aileron linkage that runs from the servo to the inner actuating arm on the torque tube with Du-Bro* ball links and short threaded rods. Although the assembly was fine for the recommended control throws, the modification allowed greater aileron travel that would permit experimentation with greater throws.



The side view shows weight-saving construction. The screws at the bottom rear corners of the canopy attach it to the fuselage.

• **Fuselage.** I encountered only one minor problem with the fuselage. The instructions call for the firewall to be drilled for the blind nuts that hold the motor mount. The firewall has a small punch mark to help locate the drilling point, but the holes for the direct-drive mount will interfere with the bulkhead support rails. The solution is to move the holes in by 1/8 inch on each side.

I also made two changes to the motor mounts that you may want to consider. First, I replaced the metric blind nuts with American Standard (4-40) blind nuts. I made this change because of my propensity for losing small screws, and American Standard blind nuts are much easier to replace when they "grow legs and walk away."

Second, I used blind nuts to mount both the geared and direct motors so that I could easily exchange motors during flight testing. This permits an easy exchange of different motor configurations—changes that would be more difficult to retrofit after the fuselage has been completed.

My tendency to lose screws has also prompted me to use a tapped hardwood block and an American Standard nylon bolt for mounting the bottom wing.

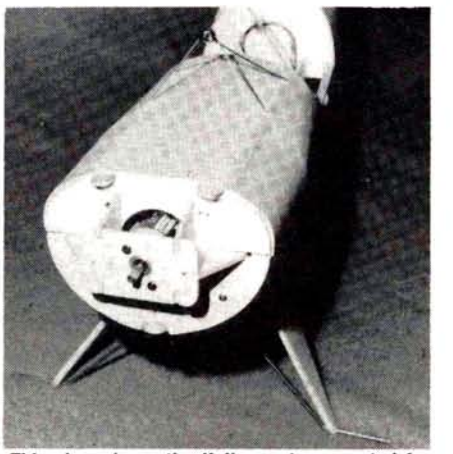
COVERING AND FINISH

Because of the amount of stick construction, very little finish-sanding is required, but make sure that no rough edges show through the covering. I used Coverite's* Black Baron red film and matching paint for all the plastic components. [*Editor's note: this is to be distinguished from Coverite's new 21st Century film.*] Applying the covering was easy, and it shrank easily. My only complaint was that the film pigment tended to separate from the plastic film along the trailing edges and the like when I used the film's excessive shrink capability for these hard-to-cover areas.

I used Coverite graphics and numbers, and I cut the wide fuselage pieces and wing markings out of large Coverite trim sheets. These trim sheets were great to work with because I could mold them around corners with relative ease. In fact, I mounted the cowl and chin plate first; then I ran one continuous strip along the fuselage, up and around the cowl and down the other side of the fuselage. After both stripes had been completed, I cut them at the cowl and chin-plate seams. I was amazed at how pliable this trim was, and I was pleased that I didn't have to paint stripes on the plastic pieces.

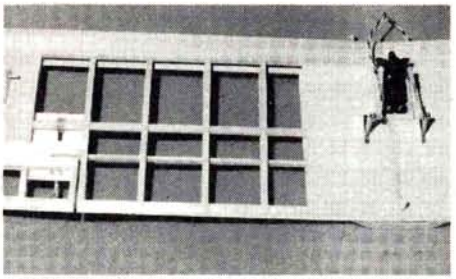
RADIO AND MOTOR INSTALLATION

I happened to have a 9-channel Futaba* receiver, but any 4-channel radio will work well. Although I used S133 microservos for the rudder and the elevator, I decided to use an S132 for the ailerons to handle the torque tubes and the flight loads from four ailerons. The receiver and the optional Robbe RSC630 speed controller are mounted with Velcro® on the bottom of the battery tray. The speed controller also provides an additional weight savings, since it has an integral battery-eliminator circuit.



This view shows the Keller motor mounted for direct drive.

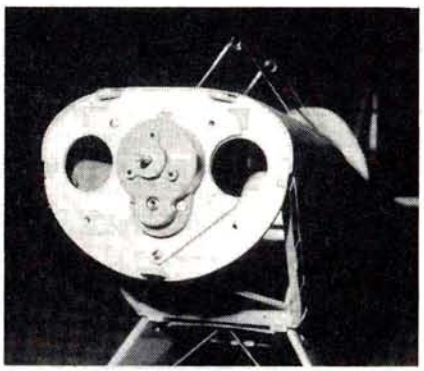
Robbe was kind enough to provide me with its optional Keller 25-10 direct-drive motor. I selected this very efficient neodyme motor for the initial flights. As I revved up the Keller



The lower-wing torque assembly is shown. Note the ball linkage added by the author. The offset on the servo horn provides differential.

to check the amperage draw for various props, I encountered a new challenge. The direct-drive-motor mount extends out from the firewall and supports the motor at its front end with no other support along the motor body. Because of this, a strong vibration occurred at higher rpm (even after I had carefully balanced the wooden props). To provide support and dampen vibration, I glued a spruce wedge onto the mount at the rear of the motor.

I don't think I've ever built a plane that has attracted so much attention from modelers and



This front view shows the geared ferrite motor that comes with the electric accessory kit (no. 31981000). The extra blind nuts on the firewall allow you to mount an alternate direct-drive system.

non-modelers alike. Everyone who sees it is taken by its appearance. It looks great on the ground, and it performs well in the air. Minor problems aside, the Pitts S1 is well worth the effort.

**Here are the addresses of the companies mentioned in this article:*

Robbe Model Sport, *170 Township Line Rd., Belle Mead, NJ 08502.*

Du-Bro Products, *480 Bonner Rd., Wauconda, IL 60084.*

Coverite, *420 Babylon Rd., Horsham, PA 19044.*

Futaba Corp. of America, *4 Studebaker, Irvine, CA 92718.*

Rev-Up; *distributed by Progress Mfg. Co., P.O. Box 1306, Manhattan, KS 66502.*

AstroFlight, *1311 Beach Ave., Marina Del Rey, CA 90292.* ■

ENGINE EVALUATION

by MIKE BILLINTON

ASP 108 ABC SPORTS

Bargain Big Bore

High output-to-weight ratio inevitably means less heat-sink capacity. This, plus a smallish muffler, emphasizes the need for generous cooling.

THE ASP 108 2-stroke is the largest of the ASP model engines from China. Its capacity is actually 1.052ci (17.24cc), and its design and performance point it firmly toward large-scale models.

The chart shows the 108's remarkably high open-exhaust and muffler torque-to-weight ratios, which place it firmly among the top runners of those I've tested.

Most of the engines for which figures are given are of recent origin, and they clearly reflect concerns about noise and keeping flying sites. There has been an appreciable reduction in rpm levels (and, therefore, sound), and this has led almost automatically to increases in torque. The first figures show the more theoretical, though nevertheless significant, open-exhaust figures, and those in parentheses show the performances of the engines when fitted with a standard, back-pressure muffler. There are fewer figures for engines with a back-pressure muffler because I tested many of them on a variety of tuned pipes rather than a standard muffler. Because the restrictions and efficiency of mufflers vary, the engines' performances with mufflers don't rank in the same order as those without.

The ASP 108 did well both with and without a muffler. With the standard, 9.3mm-outlet, back-pressure muffler (found on ASP's 61, 75 and 108 engines), high rpm levels were severely curtailed, but at low rpm (5,000 to 8,000), high torque was still evident. Thus, the 108's torque-to-weight ratio is higher than that of any other single-cylinder engine (operated here at around 6,500rpm).

On noise and efficiency grounds, this all suggests the

TORQUE/WEIGHT RATIO (ounce inches/pound)

Figures in parentheses show readings taken when engine had been fitted with a standard, back-pressure muffler

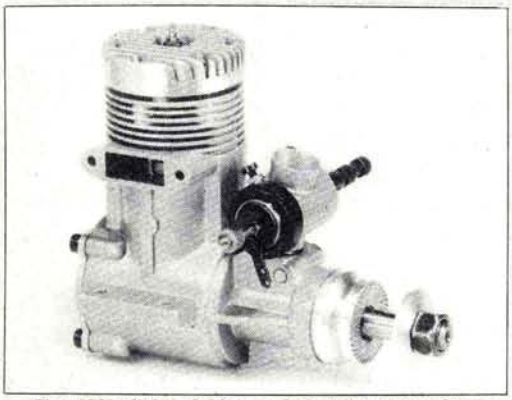
Engine	Open Exhaust
O.S. Max 35	156 (101)
ASP 108	147 (113)
Webra 50 Speed (heli)	145
Super Tigre 6000 Twin	143 (128)
Enya 80 XF	142 (108)
Super Hustler 44cc	142
Fox Eagle 74	140 (113)
OPS 80 fan	134
O.S. 91 fan	132
ASP 75 heli	126 (94)
Irvine Sports 46	125 (86)
Super Tartan Twin 44cc	125
Saito 80 FS	122
OPS 60 twin	121 (95)
Super Tigre S45K ABC	120 (85)
YS F120	114
Enya 30 SS	113 (94)
Super Tigre G49	112
Super Tigre G34 heli	112
OPS 30cc	109 (80)
Rossi 61 (3+2)	109
Enya R120	108 (99)
YS 60	107
ASP 61	107 (74)
Enya 60X heli	104
HB 61 (spark)	104 (82)
K&B SR11	103
OPS 60 SPA	103 (95)
Irvine 40	102
Super Tigre 2000	100 (79)
ASP 40	100 (72)
Kavan FK 50	(89)
Fitzpatrick 61	(75)

The short solid crankcase is durable. The hard, high-silicon piston will also be durable and give good compression for a long time.

use of fairly heavy-load propellers; I used the 15x8 Graupner, the 18x7 Mastro and the 16x12 APC. ASP suggests the use of a 14x8 or 15x6 prop, which would allow muffled rpm to rise toward 10,000—with more horsepower and sound, too, of course.

A small muffler begins to bite into performance considerably as rpm rise to around 7,000 to 8,000. At 11,000, it's no surprise to find that the 108's performance is exactly on a par with that of the ASP 75 (both using the same muffler).

A last interesting comparison is that the ASP 108's performance (at least, in open-exhaust form) resembles those of the larger 22cc Super Tartan single-cylinder 2-stroke and the fearsome 20cc YS 120 4-stroke. Given the 108's relative lack of external sophistication, this is surprising, and it reminds us that there's more to model engines than meets the eye. It also means that ASP is still churning out meaningful liner/piston assemblies!



The 108's light, rigid one-piece case means less vibration.

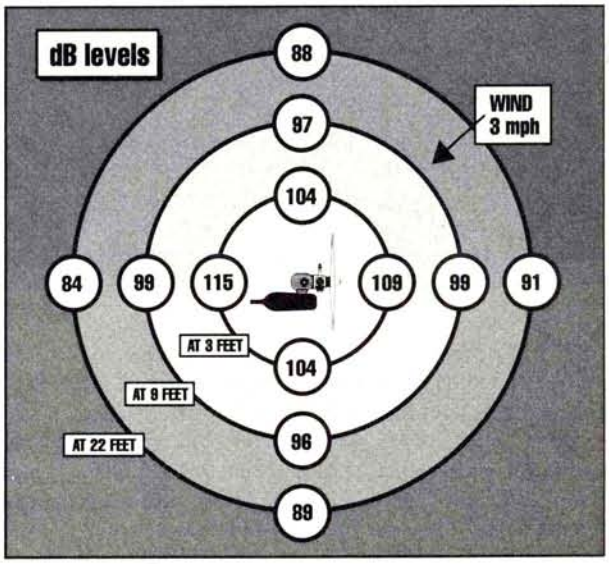
Bearing in mind its manufacturer's claim of 3.28hp at 17,000rpm, the ASP 108's test performance was quite restrained. Given that it has a carburetor bore of 11.2mm (the same as the much smaller 61 engine) and that its soft induction timing is more suited to low rpm, the 108's drop-off performance past 15,000rpm is to be expected, as is the max of 2.71hp at 15,320rpm. Fortunately, this is irrelevant, because (as discussed) it will probably be operated between 6,000 to 11,000rpm, where the best muffled torque will be available.

MECHANICAL POINTS

ASP now uses a one-piece crankcase/front housing. This contributes somewhat to the 108's lightness and gives it the rigidity that's necessary to cope with high torque.

SOUND LEVELS —dB

Engine: ..... ASP 108 R/C ABC Sports
Equipment: ..... Standard muffler
Fuel: ..... 10-percent nitro
Temperature: ..... 72°F
Humidity: ..... 84 percent
Propeller: ..... 15x8 APC
Mean rpm: 8,750
Engine position: .. 3 feet off the ground
Sound meter ..... Radio Shack's 33-2050 unit set 38 inches off the ground and pointing toward nearest sound source, i.e. propeller or muffler outlet.
Meter settings: .... "A" scale and "slow"
Distance from engine: ..... 5 feet, 9 feet and approximately 21 feet



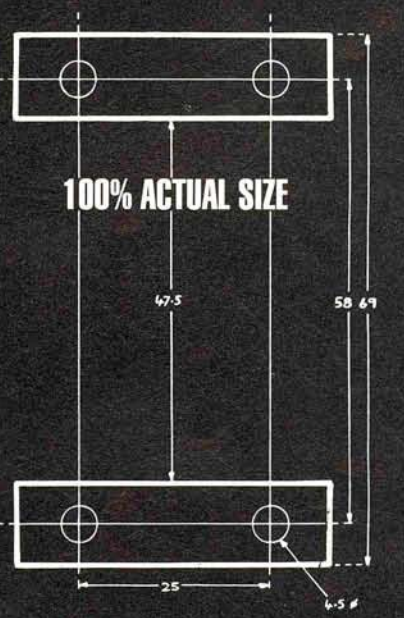
SPECIFICATIONS

WEIGHTS & DIMENSIONS

Capacity	1.0519ci (17.237cc)
Bore	1.123 in. (28.33mm)
Stroke	1.062 in. (26.975mm)
Stroke/bore ratio	0.946:1
Timing periods	Exhaust - 160° Transfer - 138° Boost - 121° (angled up 60°) Front Induction: —Opens - 27° ABDC —Closes - 29° ATDC —Total Period - 182° —Blow-down - 11°
Combustion volume	1.4cc
Compression ratios	Geometric - 13.3:1 Effective - 8.96:1
Exhaust-port height	0.375 in. (9.55mm)
Cylinder-head squish	0.037 in. (.94mm)
Cylinder-head squish angle	10°
Squish-band width	0.174 in. (4.42mm) [outer ring is flat, .051 in. (1.3mm) wide]
Carburetor bore	0.440 in. (11.2mm)
Crankshaft diameter	0.787 in. (20mm)
Crankshaft bore	0.523 in. (13.3mm)
Crankpin diameter	0.275 in. (7mm nominal)
Crankshaft nose thread	0.368 in. x 24 TPI (3/8 UNF)
Wristpin diameter	0.275 in. (7mm)
Connecting-rod centers	1.81 ins. (46mm)
Engine Height	4.38 ins. (111.4mm)
Width	2.73 ins. (69.3 mm)
Length	3.94 ins. (100mm)
Width between bearers	1.88 ins. (47.7mm)
Mounting-hole dimensions	2.28x0.984ins. (58x25mm)
Exhaust-manifold bolt spacing	1.338 ins. (34mm)
Frontal area	9.4 sq. ins.
Weight	Bare - 23.9 oz (676 gms) With muffler - 28.6 oz./ 810 gms)
Crankshaft weight:	5.25 oz. (150 gms)
Piston weight:	0.65 oz. (20 gms)

Performance:

Max. b.hp	2.71 @ 15,320rpm (open exhaust /10% nitro)1.77 @ 11,900rpm (standard muffler/ 10% nitro)



Max. torque:	220 oz./ins. @ 9,700rpm (open exhaust/10% nitro.) 200 oz./ins. @ 5,820rpm (standard muffler/ 10% nitro)

RPM on standard fixed-wing propellers:

	Open exhaust	ASP muffler
18x7 Mastro	6,350	5,960
16x12 APC	7,160	6,880
15x8 Graupner	9,340	8,500
13.5x12.5 APC	9,510	9,030
15x8 APC	9,740	8,960
16x5 Zinger	9,900	9,100
14x7 Graupner	10,520	9,680
15x6 Airflow	10,560	9,700
14x8 APC	11,030	10,050
13x6 MK glass	13,070	11,650
13x6 Top Flite	13,430	11,660
12x6 Graupner	14,460	13,030

Performance Equivalents:

b.hp/ci	2.57
b.hp/cc	0.157
Oz. in./ci	209.14
Oz. in./cc	12.76
Oz. in./lb.	147.3
Gram meter/cc	9.11
b.hp/lb.	1.81
b.hp/kilo	4.01
b.hp/sq. in. frontal area	0.29

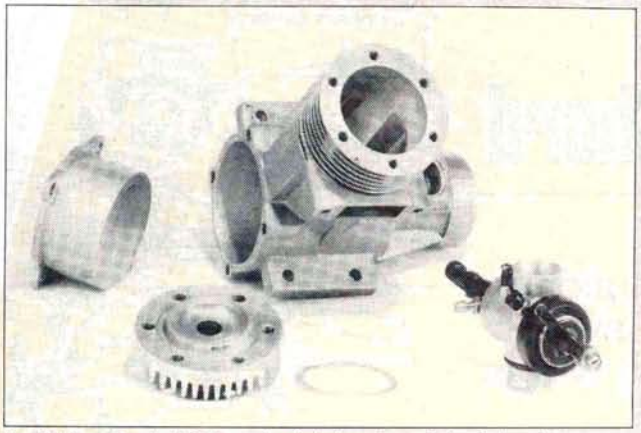
Manufacturer: ASP Engines, People's Republic of China; U.S. Distributor: ISC International, P.O. Box 40116, Indianapolis, IN 46240.

The ASP 108's one-piece, solid-steel, 20mm crankshaft and weight of 5 1/4 ounces give a stroke that's .009 inch less than the stated size. The prop-stud thread is a solid 3/8 UNF with a tapered collet drive.

The liner/piston follows the standard ABC system. As with other ASP engines, the choice of materials and the fit of the piston and liner are crucial to the 108's success; long life and fine low-friction compression are assured. The connecting-rod forging is bushed only at the big end, but there are oil holes at both ends.

The cylinder head meets the usual combustion-chamber specifications, and the 0.037-inch squish clearance is generous. Its effective compression ratio of slightly less than 9:1 offers flexible, detonation-free performance at low rpm. Even so, the combination of very good piston fit and large capacity has led some users to lower the compression ratio by adding one or two 0.003-inch-thick gaskets.

In keeping with the expected low rpm usage, all the port timings



The 108 has standard, Schnuerle, twin transfer and single boost passages.

and induction openings are relatively restrictive.

PERFORMANCE

The precision of the piston/liner fit means that the engine requires only minimal running-in—as its manufacturer predicts.

In my tests, I used a range of propellers, including some by APC, and a strong, steady performance was soon evident.

It's worth commenting on rpm figures: they're useful for comparison (as long as you know the weather conditions), but they sometimes need "interpreting." Here are some of the problems encountered:

- Air that's unusually dense and richer in oxygen will increase power *and* increase the air resistance encountered by the propellers. Under these conditions, it's difficult to increase rpm, and there might even be a small reduction. Props with high static pitch will stall completely, and this will obviously affect results.
- Alternatively, a dense atmosphere may contain a lot of water vapor, and the reduction in oxygen content will *reduce* power, while the prop itself still has to contend with the increased atmospheric density. The reduction in rpm could be considerable.

That's all true when the engine is being run on your workbench. If you add the effect of changes in air density on the aircraft itself (it could use a smaller prop when air density or rpm are high), you'll appreciate the potential problems. (The actual problems are usually much less and are mainly of interest where high performance is sought.) Atmospheric changes can lead to suspect rpm results, and you should bear this in mind when comparing engine performances.

- Attempts to compare several brands of propeller with the same nominal dimensions can also be futile. The new APC props, for example, regularly rotate a lot faster than other makes of the same size because their narrow, pointed tips suffer less drag.

POWER TESTS

Test 1. Open exhaust. Fuel: 10 percent nitro/15 percent ML 70 synthetic oil. Plug: GPS 250 glow.

ASP recommends a "good commercial glow fuel (preferably with 10 percent nitro," and who am I to argue!

At a low 4,900 rpm, I immediately noted a high torque of 193 ounce/inches, and this figure rose continuously until reaching a maximum of 220 ounce/inches at 9,700 rpm. Maximum horsepower was reached at a modest 15,320rpm—just what you'd expect from the ASP 108's mild porting, small carburetor and the manufacturer's expectation that it will be used in large-scale models. Past 17,000rpm, torque declined steadily, so I ended this phase of the test.

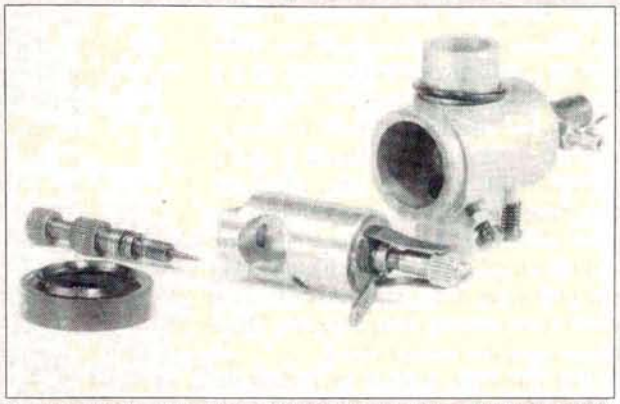
Vibration levels were low, and throttle and needle responses were predictable, firm and responsive.

Test 2: Standard muffler. Fuel and plug as in Test 1.

As I said earlier, this universal muffler is a standard fitting on ASP's 61, 91 and 108 engines. It must, therefore, be too big for the smaller 61 engine, or too small for this 108, which is 75 percent larger.

The muffler's 9.37mm outlet slightly restricts this larger engine, but at rpm up to around 9,000, this restriction has no adverse effects. Making one muffler fit three engines is a useful ploy by ASP, and it does mean less noise and good low-rpm operation for large-scale models.

The graph shows these features clearly; as rpm rose above 12,000, ragged running was obvious as fuel and exhaust gases found their route through the engine rather restricted! Beyond 14,000rpm, forget it!



The short, stubby, O-ring fuel needle ensures positive, drift-free operation. The steel throttle-barrel bore is quite small (11.2mm) and restrictive for a 1.08ci engine, but it's perfect for low rpm.

dB LEVELS

Given the ASP 108's relatively large capacity, dB levels were acceptable but, at 8,750rpm, they exceed the UK's Department of the Environment specifications of 82dB at 21 feet and the U.S.'s AMA maximum of 90dB at 9 feet. It would therefore be sensible to operate it at around 7,000rpm, and there are also clear torque advantages to doing this.

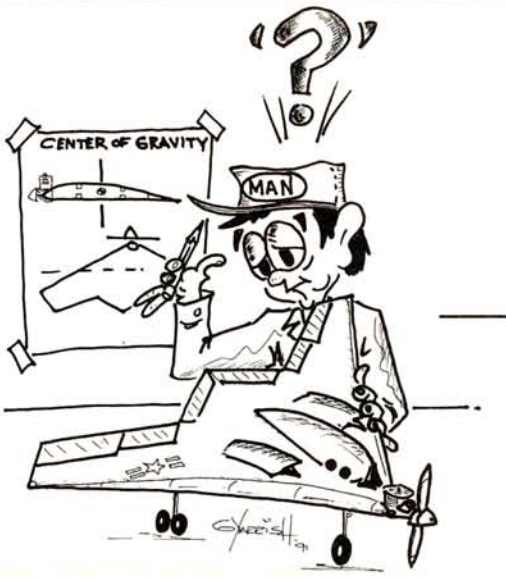
IDLING

Using a 15x8 APC propeller, a standard muffler and a pressurized fuel feed, 1,600rpm were easily reached, and the 108 proved rock solid and very responsive to quick throttle openings.

SUMMARY

The ASP 108 looks unpretentious, but it's a fine, very solid performer, nevertheless. It's also good value for the money. ■

How To Compute the Mean Aerodynamic Chord



Graphic solutions for straight, swept and tapered wings

by JAMES McCLURE

JUST ABOUT THE one most important factor in flying your model safely and successfully is balancing the model to place its center of gravity (CG) in the proper location. The generally accepted location of the CG is at a point that's at 25 percent of chord of the mean aerodynamic chord (MAC) from the leading edge of the MAC. This article shows you how to locate the MAC so that you have the proper reference for your preferred CG location, be it at the 20 percent or 25 percent or wherever.

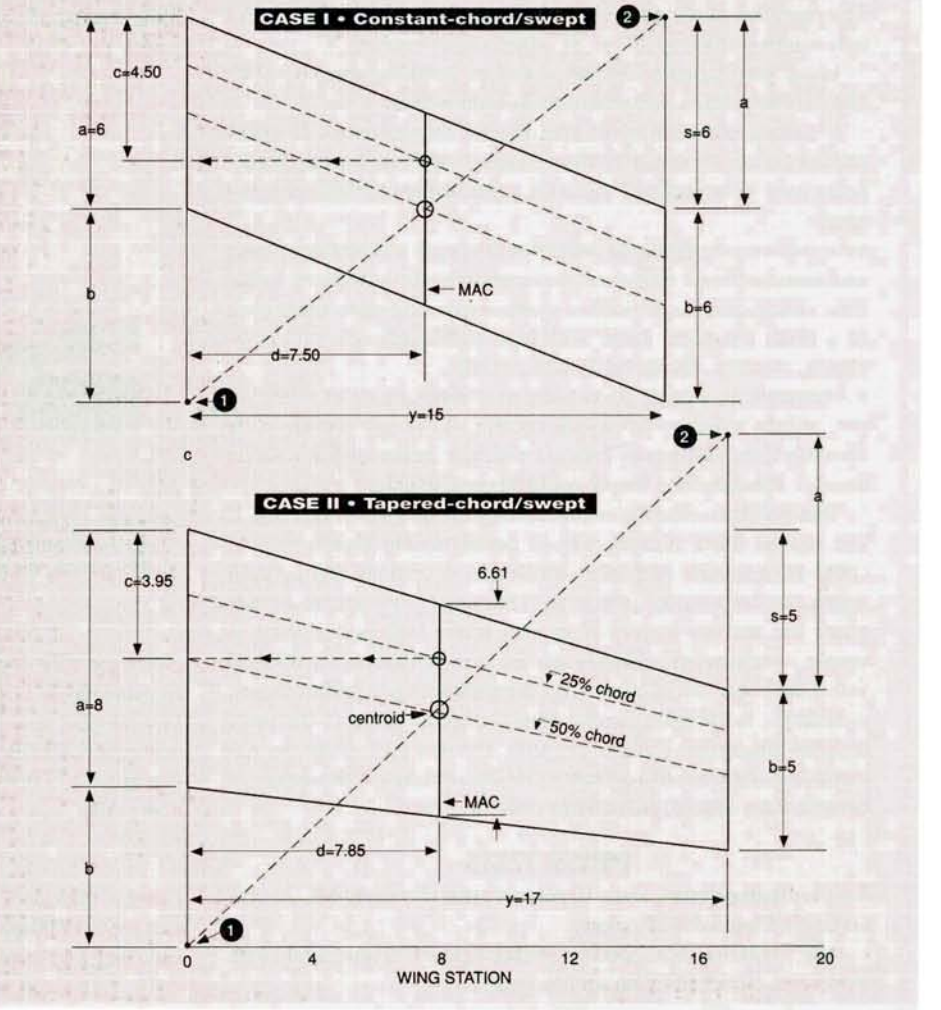
First, let's define the MAC. In *Peery's Aircraft Structures,* by David J. Peery (McGraw-Hill Book Co. Inc., 1950), we find: "For a rectangular wing planform, the value of the MAC is equal to the wing chord, and for a trapezoidal planform of the semi wing the value of the MAC is equal to the chord at the centroid of the trapezoid." Note that it is *not* the average chord.

The following method for finding the MAC is from *Elements of Practical Aerodynamics,* by Bradley Jones (John Wiley and Sons, 1942).

1. Draw the wing full-scale, or to scale on graph paper, if it's a large wing. These dimensions are required:
a=length of root chord
b=length of tip chord
s=sweepback of leading edge of tip chord
y=perpendicular distance, root chord to tip chord

2. Construct the following lines:
25-percent chord line (between 25 percent points on root and tip chords)
50-percent chord line
Extend root chord "a" aftward by length "b"
Extend tip chord "b" forward by length "a"
Draw a line from 1 to 2 as shown on the illustration.

GRAPHICAL MAC SOLUTION



3. Where line 1-2 intersects the 50-percent chord line is the centroid of the half wing, and a chord drawn through the centroid is the MAC. Draw in this MAC, and the intercept of the MAC with the 25-percent chord line is the 25 percent MAC that we're looking for. Project this point perpendicularly to the root chord. This gives us dimension "c." as shown on the illustration. Now we have the answer, using only graphical methods. Locate and mark this position on your fuselage.

4. If you're handy with math, or wish to check the precision of your graphical solution, you can calculate dimension "c" directly, as follows:

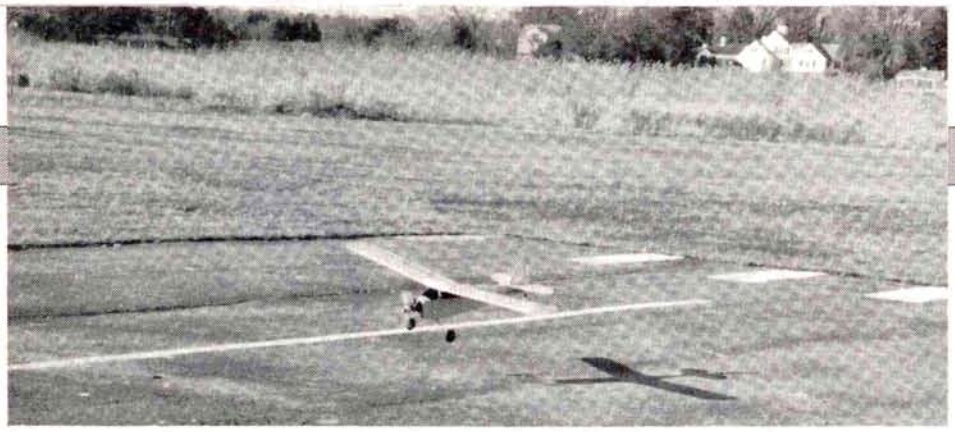
$$c=\frac{s(a+2b)}{3(a+b)}+\frac{1}{6}\left(a+b-\frac{ab}{a+b}\right) \quad \text{(25\% MAC only)}$$

Case I is a typical, constant-chord swept wing. Since it's constant chord, the MAC is at mid-span, and dimension "c" can be found by drawing the mid span chord, locating the 25-percent point on the chord, and projecting this point to the root chord. Case II is a tapered/swept wing, which requires the full solution. Now let's do Case II by the geometry equation:

$$c=\frac{5(8+(2\times 5))}{3(8+5)}+\frac{1}{6}\left(8+5-\frac{8\times 5}{8+5}\right)=3.9615$$

(You can compare this answer to 3.95.) This method is applicable only when both leading and trailing edges are straight. Remember that the leading and trailing edges must be drawn so that they continue to the center of the fuselage, even though you might not be able to see the wing inside the body.

It's that simple, and it sure beats the "eyeballing" method when you're scratch-building a tapered-wing plane.



To land successfully, the airplane must fly through the key position, which is located about 10 to 15 feet above the end of the runway. Here, the plane has flown through the key position and is approaching touchdown.

Flying through the key point

THE GILBERT APPROACH TO LANDING

by BOB GILBERT

MANY R/C pilots fly all the time; they make a lot of landings and wreck a lot of planes. They typically make only one landing in each flight, and it's performed only as a necessity. Although they may be accomplished, high-time pilots, they haven't mastered landings. These pilots usually get the plane back to the field in one piece and, in doing so, often run off the side or the end of the runway.

Taking off is infinitely easier than landing, especially with the overpowered aircraft seen at the field, and many people feel that if they know how to take off, then they automatically know how to land. If any of this describes you, please read on.

These steps are designed to help you become proficient in the execution of landings. To master landings, there are two things you must do:

- find a technique that works for you and your airplane;
- practice and then practice some more.

The technique that I describe is borrowed from Roger Maves who taught me to fly a full-size Piper Cub way back in 1954. I've applied it to R/C and practiced it a lot. Now, on occasion, I do more than 60 touch-and-go's in one flight, and it's a lot of fun. So here goes. Read it a few times, set up your aircraft properly, and then bring this article to the field and read the important parts again before you fly. Happy landings!

EIGHT STEPS

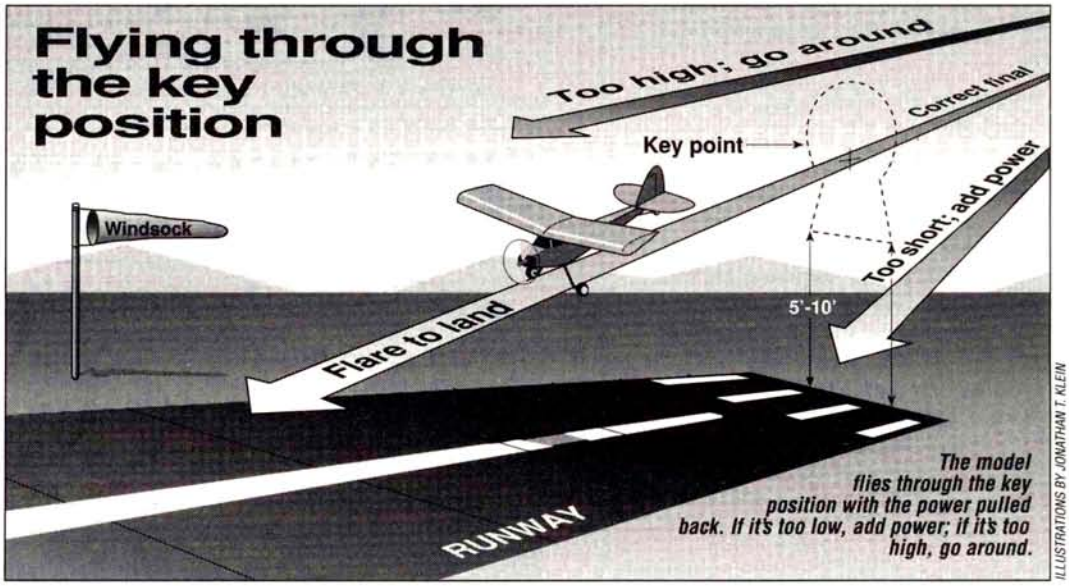
- **Aircraft selection.** I strongly suggest that you use a 3-channel trainer. If you're using a 4-channel aircraft, and you really know how to control the rudder, then go ahead and use it. Be honest with yourself. If you don't know how to keep the aircraft straight ahead on takeoffs and landings, go back to that good old 3-channel rig.
- **The pattern.** Refer to the pictorial provided, and learn the basic parts of the pattern. Memorize the position of the *key point*. This point is the most important ingredient for successful landings.

Go to your local airport, and watch the full-size aircraft fly the pattern. Notice that it's rectangular and that it's normally flown with four distinct turns. (The turn from downwind to final is often flown as one sweeping 180-degree turn, but I don't recommend this. See the diagram.)

- **Preparation.** Set up your airplane so that it idles without stalling and its throttle response is good. The size of the wheels should suit the runway conditions. I don't care how small the plane is or what the kit calls for. On grass, the wheels should be no less than $2\frac{3}{4}$ inch in diameter, and you should also remove the wheel pants.

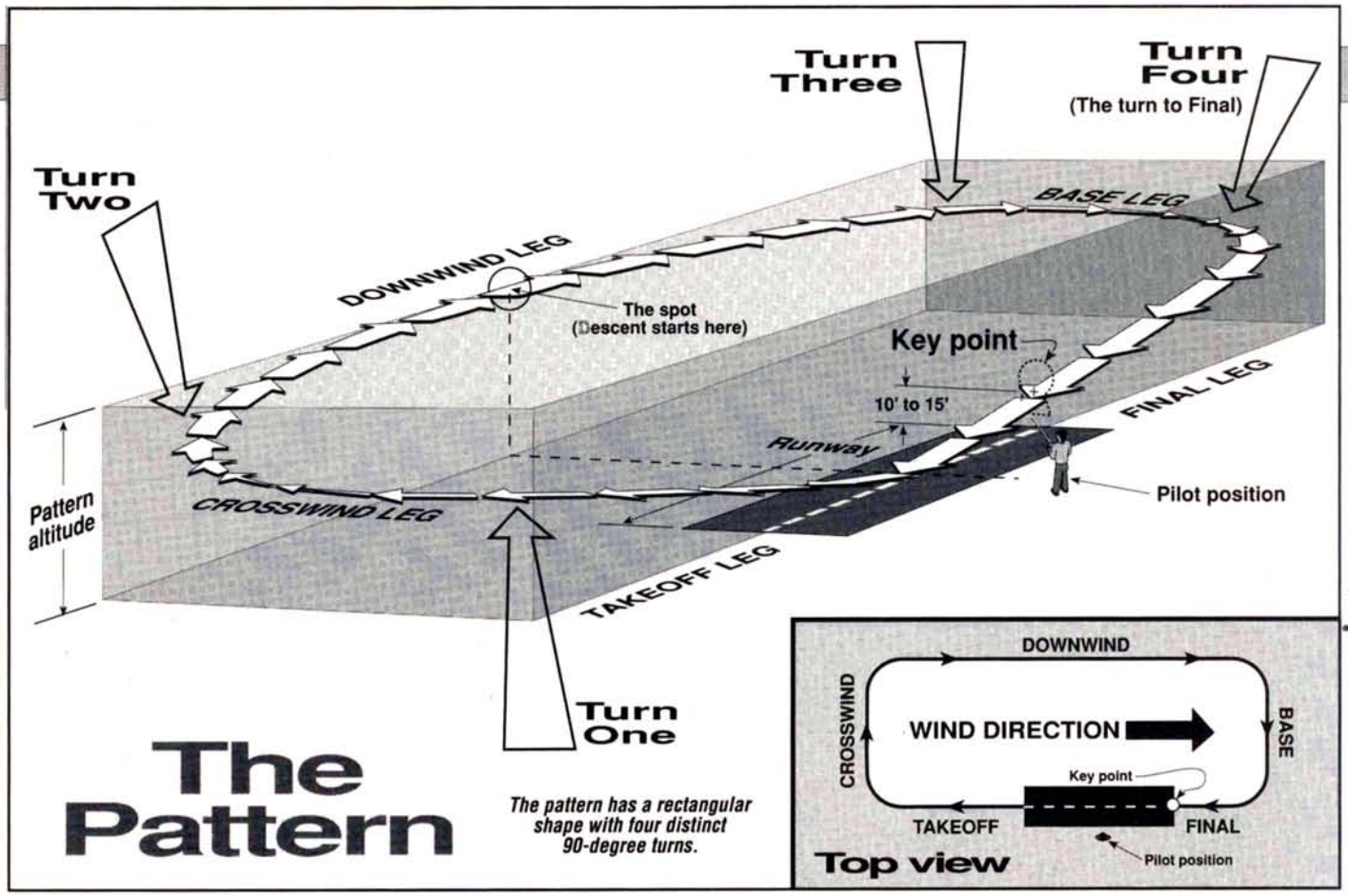
Now it's time to fly. Be sure to operate in accordance with the rules of the field. Try to pick a time when there aren't many others there so that your operations won't interfere with theirs.

- **Throttle and stalls.** Take off and climb to altitude out of the pattern. At this point, you must learn and practice how to use the throttle correctly and how to perform straight-ahead stalls. To start, slowly reduce the throttle while



The model flies through the key position with the power pulled back. If it's too low, add power; if it's too high, go around.

ILLUSTRATIONS BY JONATHAN T. KLEIN



you hold the aircraft straight ahead and at a constant altitude. Reduce the throttle until the plane reaches idle, and feed in up-elevator until the aircraft stalls. A trainer-type plane (low wing loading) may stall straight ahead. A plane with a higher wing loading may drop one of its wings and then its nose. To recover, add some power and up-elevator. Full throttle isn't necessary.

Practice this stall and recovery until you recognize the speed at which the aircraft stalls. This will also enable you to practice with the throttle—something that you must learn to operate to make good landings.

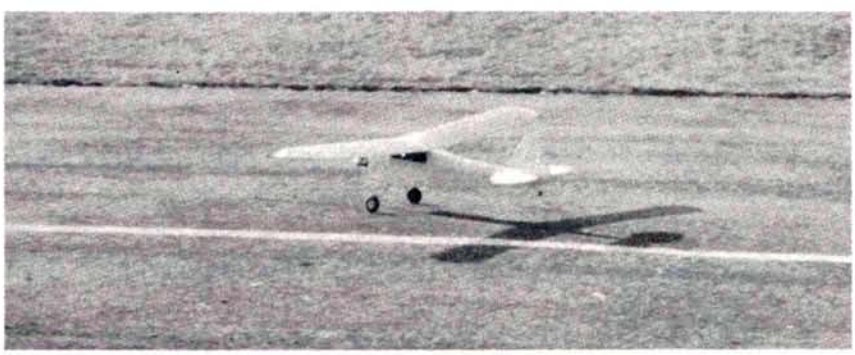
• **Fly the pattern.** Return the plane to the pattern area. Keep it at a constant altitude, and fly the rectangular pattern until you're comfortable with it (especially the four 90-degree turns). Fly at a moderate speed—certainly at less than full throttle. When you feel that you know how to fly the pattern, move on to the next step.

• **Go-arounds.** Look at the runway, and find the key point. It's about 10 or 15 feet above the approach end of the runway. To make a good landing, you must fly through the key point. To learn this, make a series of go-arounds. Every landing approach need not be followed by a landing. If the approach is poor, the landing will be poor. A good approach will generally produce a good landing. You should make a go-around whenever it's apparent that the approach isn't good.

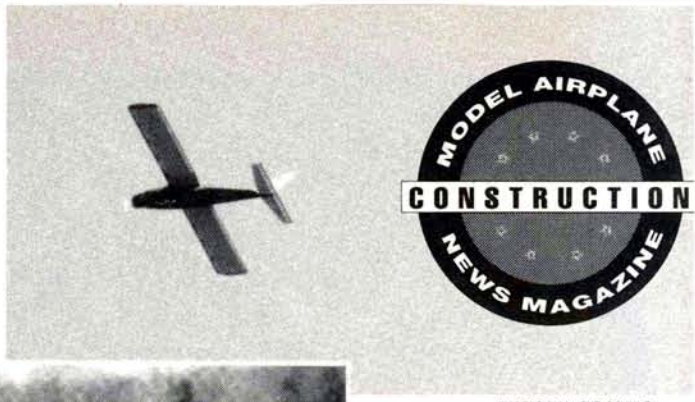
The assumption at this time is that the wind is light to nonexistent. Don't attempt these exercises in high wind until you've gained some experience. The landing approach starts when the aircraft is on the downwind leg opposite you. When it's in that position, reduce the throttle. Most trainers glide well enough to allow you to close the throttle completely. Start the descent. Control the speed by changing the pitch attitude—nose-up or down. Make a nice, gradual turn to base and continue to descend. Keep the aircraft speed slow, but stay well above the stall speed. If you descend below the desired glide path with insufficient speed to pull the plane's nose up without stalling, add a little power. Keep the key point in mind and turn to final, with the nose heading right through the key point. When the plane is just above the end of the runway, going through the key point, apply some (not full) throttle to go around. (Using less than full throttle reduces the engine's torque output, so less rudder correction is required to keep the aircraft straight.) Climb to the normal pattern altitude, and repeat the procedure.

Determine the altitude at which you want to fly and precisely where you should cut the throttle. Find the spot in the sky that allows you to close the throttle completely and come through the key point at close to stall speed, without ever opening the throttle. The plane should glide from the midpoint of the down-

(Continued on page 81)



What makes a landing perfect? When the plane stalls just as its wheels touch the ground.



MODEL AIRPLANE CONSTRUCTION NEWS MAGAZINE

PHOTOS BY LLOYD SCHULZ

■ *1. Above: Speed increases and the glide flattens when the gear are retracted.*

■ *2. Left: The Aerostar approaches landing with gear deployed.*

Build In-line Fuselage Retracts

by LLOYD SCHULZ

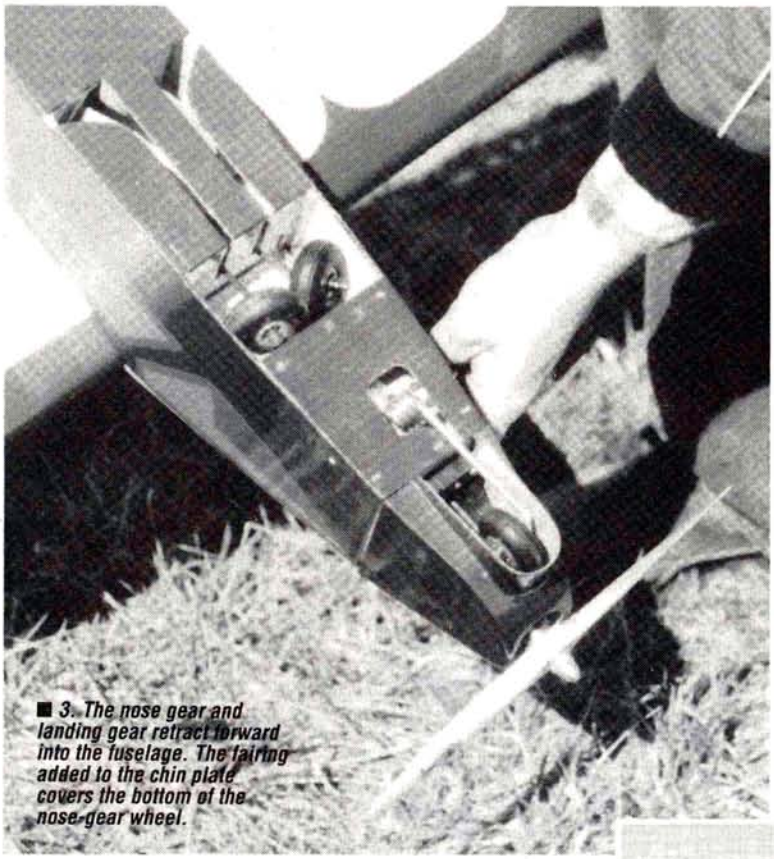
DESIGNING MODEL planes is my favorite part of the hobby, and because I fly electric, most of my designs are intended for maximum speed at minimum power. To obtain this speed, the model must be clean and light, and this suggests retractable gear.

In half of my designs, the main gear retracts into the fuselage instead of into the wing. Since no one sells a mechanism to do this, I created one (similar to the retract action on single-engine Cessnas) that folds the main gear down so that the gear legs are first parallel and then extended. It then retracts the legs by pulling the gear together and up into the fuselage.

To model this design, I built a retractable Midwest* Aerostar 40, and my modifications required a substantial departure from the kit plans. For power, I chose Hobby Lobby's* Ultra 1600 motor that runs on 14 1700mAh SCE cells. Spinning a 10x8 prop at about 8500rpm, this system pulls about 23 amps static and is good for 4 to 5 minutes of fairly fast, full-throttle flight. (See photos 1 and 2.)

ABOUT WEIGHT

You'd like all these pieces to be weightless but, of course, they aren't, nor can they be as light as fixed gear. My gear add about 6 ounces to the overall weight, which I found acceptable in a .40-size model. (If you substitute a light servo for a portion of the steering mechanism, you can save another .7 ounce.) This prototype Aerostar weighs 108 ounces, which is light for wet power, but heavy for electric. I could have built it lighter by scratch-building the fuselage instead of using the kit's plywood, but the whole idea was to adapt my gear to an existing trainer.



■ *3. The nose gear and landing gear retract forward into the fuselage. The fairing added to the chin plate covers the bottom of the nose-gear wheel.*

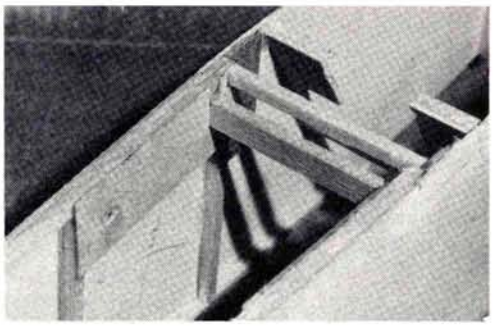
This design can be adapted to many different planes. Of course, certain parts will have to be "eyeballed" and customized to fit. I'll discuss the project in building sequence.

Pull up your wheels Cessna style

FUSELAGE

To provide space for the retracted gear, join the fuselage sides at the bulkhead nearest the wing's leading edge. Then, add the firewall, and join the aft fuselage at the very end of the tail. To accommodate the 2-inch-diameter main-gear wheels, widen the bulkhead to about 3 1/2 inches, which is 1/2 inch wider than is called for in the plan. (This

■ *4. The author shows off his modified Aerostar. With an electric drive system (Ultra 1600, 14 Sanyo 1700mAh SCE cells and a 10x8 Top Flite* prop), the plane weighs 6 pounds, 12 ounces.*



■ *5. Above left: The nose-gear mounting plates are glued to the square-stock verticals, to the firewall triangle verticals and to the longeron sections that run between the verticals along the fuselage bottom. Note the reinforcing ply doubler behind the axle hole and the 3/32-inch-ply cross block that serves as a nose-gear downstop.* ■ *6. Above right: The main gear-mount plate is installed. Note the vertical square stock that was added to fuselage side. The 1/4x1/2-inch spruce cross brace absorbs the main gear loads. (See photo 9.)*

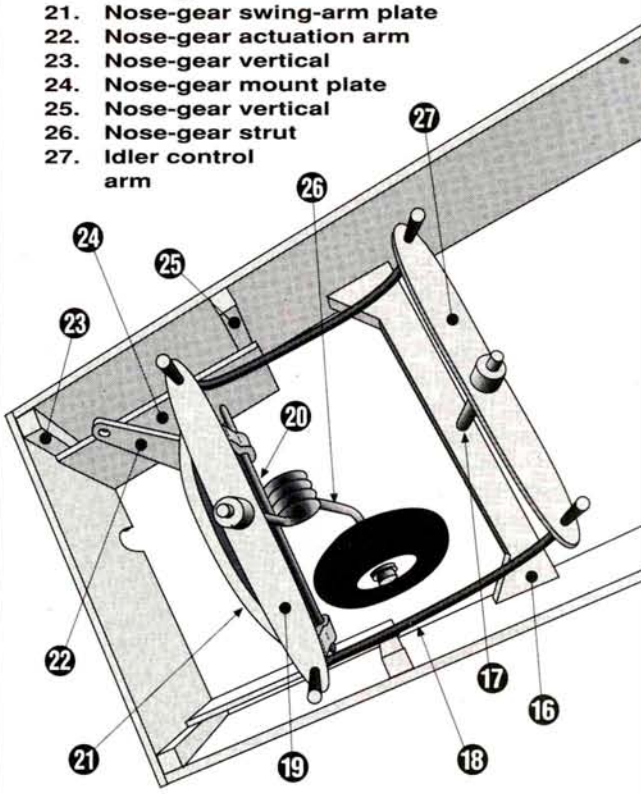
isn't noticeable in the finished model.)

Next, prepare the fuselage for the gear pieces. Glue 1/4-inch balsa square-stock verticals and longeron segments to the inside of the fuselage to serve as nose gear and main-gear load distributors. (See the illustration to identify these pieces.) The nose-gear and main-gear mounting plates distribute the landing load to the fuselage. What I call the "swing-arm axles" pivot in the mounting plates. The nose gear rotates on this axle during retraction, and the main gear is actuated when the main-gear swing-arm pivots on its axle. Glue the 1/16-inch-ply nose-gear and main-gear mounting plates to the verticals and longeron segments. (See photos 5 and 6.)

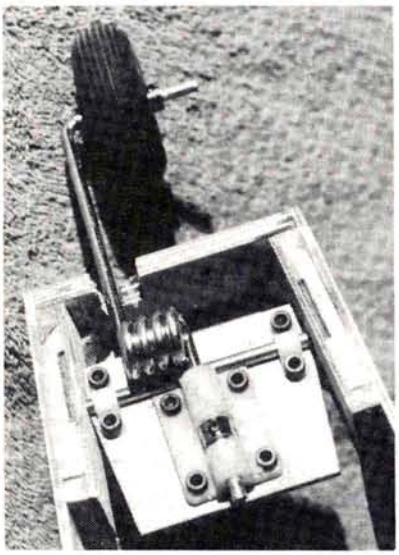
BUILDING THE NOSE GEAR

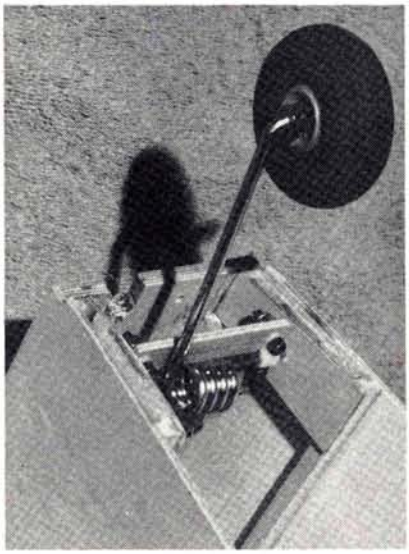
• **Location of the nose-gear swing-arm axle.** The 1/8-inch-ply nose-gear swing-arm plate holds the nose strut and rotates around the pitch axis for retraction. Using the kit's plans as a

1. Swing-arm axle
2. Main-gear vertical
3. Main-gear mount plate
4. Actuation arm
5. Down-lock cross-brace
6. Main-gear vertical
7. Gear-up hard spot
8. Main-gear leg
9. Main-gear wheel
10. Outside guide plate
11. Main-gear swing-arm plate
12. Main-gear mount axle
13. Gear-down hard-spot block
14. Center guide plate
15. Vertical guide plate
16. Idler-mount brace
17. Idler post
18. Steering cable
19. Nose-gear steering arm
20. Nose-gear mount axle
21. Nose-gear swing-arm plate
22. Nose-gear actuation arm
23. Nose-gear vertical
24. Nose-gear mount plate
25. Nose-gear vertical
26. Nose-gear strut
27. Idler control arm

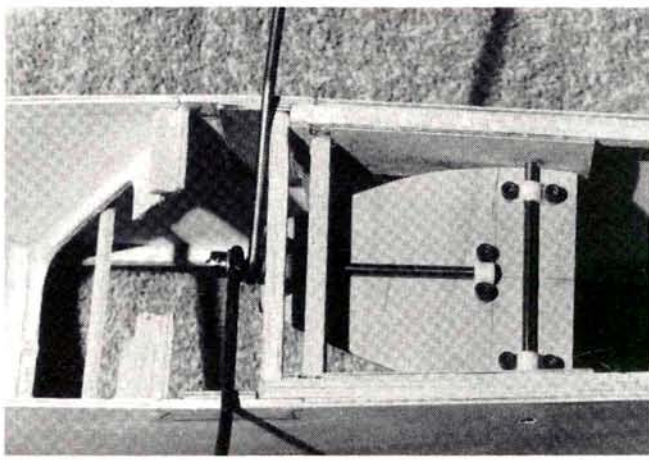


■ *7. Above, from left to right: nose gear, nose-gear swing-arm plate, steering horn and idler horn. Note the pull/pull cables.*





■ *8A. Above left: installed nose gear in extended position.* ■ *8B. Above right: the nose gear installed in the retracted position. Light-duty nylon straps anchor the landing-gear strut.* ■ *9. Right: the main gear is fully extended. Note the close fit of the swing-arm plate.*



Build In-line Fuselage Retracts

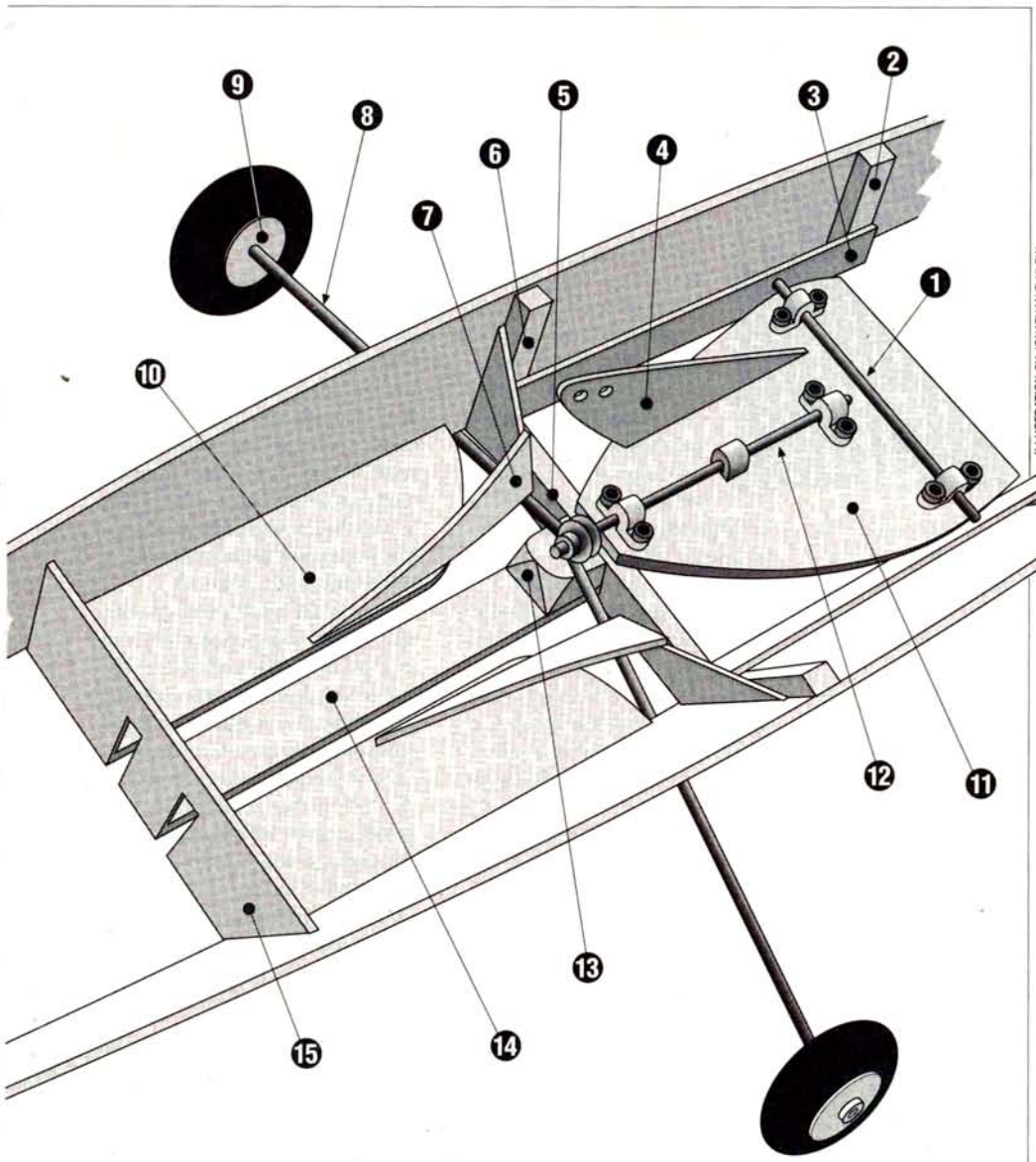


ILLUSTRATION BY JONATHAN T. KLEIN

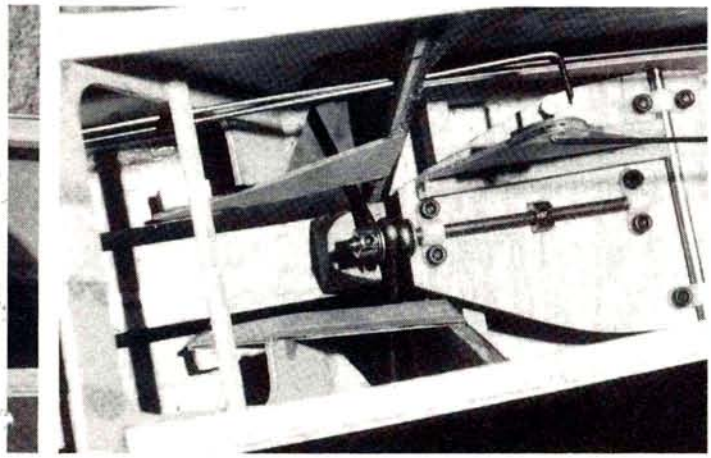
Fuselage retracts detail

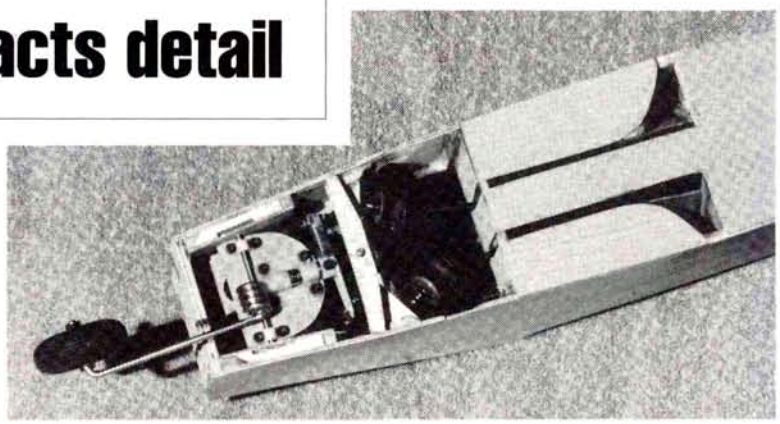
reference, place the nose-gear swing-arm plate axle 1/2-inch above the fuselage bottom. To determine how far back from the firewall to mount this axle, allow room for the nose gear and the wheel in its retracted position; then choose an appropriate mounting point.

As you can see in photo 8A, this axle is located on the nose-gear swing-arm plate just below the lower nylon strut support. I used a 1.5-inch wheel for the nose gear.

• **Nose-gear strut.** Use the nose-gear strut from the Aerostar kit. It projects above the top of the moveable swing-arm plate to attach to a double-armed control horn (pull/pull linkage) for steering, and it's mounted with light-duty-nylon landing-gear straps so they'll break away on hard landings instead of damaging the retract mechanism.

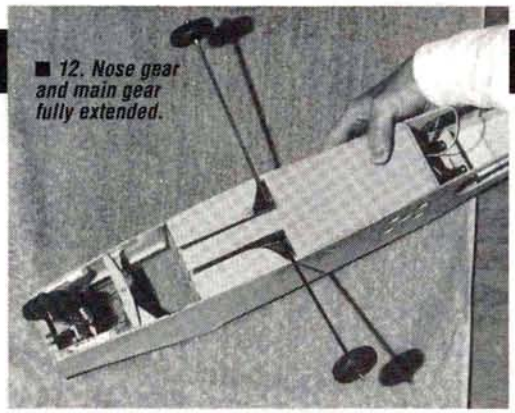
• **Nose-gear down lock.** The nose gear swings up and forward to retract, and





■ *10. Left: The main-gear legs are attached to the mounting axle with keepers and a washer. To anchor the keeper, be sure to file a flatin the axle. This inside view of the extended main gear reveals the gear-down hard spot that supports the extended main-gear legs.* ■ *11. Above: The nose gear and main gear are fully retracted. Outside and center guide plates are visible on the bottom of the fuselage. Vertical guide plates hold the retracted gear in position and support the cabin floor above the retracts. Also visible is the cross-brace used to support the bottom of the idler shaft.*

Build In-line Fuselage Retracts



■ 12. Nose gear and main gear fully extended.

down and rearward to extend. Place a 3/32-inch aircraft-plywood cross block on the rear of the firewall so that the top half of the nose-gear swing-arm plate braces against it when the nose gear is fully extended. (See photo 5.) Remove just enough wood from the firewall so that the nose-gear leg can retract through it.

BUILDING THE MAIN GEAR

The main-gear swing-arm is a 1/8-inch plywood plate that rotates on a piano-wire axle around the model's pitch axis. It carries a second piano-wire axle (the main-gear-mount axle) longitudinally to hold the inboard ends of the main-gear legs. The swing-arm was made to just fit inside the mounting plates. (See photo 9.)

Using the kit plans again, place the main-gear swing-arm axle 1/2 inch above the fuselage bottom and the length of the swing-arm plate back from the normal gear location shown on the plans. This will position the extended gear correctly.

• **Down-lock cross brace.** Made of 1/4x1/2-inch spruce, this cross brace absorbs main-gear loads in three directions. It cushions the rearward and upward shock of landing, and it anchors the moveable end of the swing-arm so that the main-gear side loads are transferred to the cross-brace. (See photos 6 and 9.)

• **Gear legs.** Use the gear legs supplied in the Aerostar kit. Bend the inside end of each gear leg into an eye for mounting on the main-gear-mount axle. These eyes wrap around the axle at the end of the swing-arm plate, and they're secured by washers and a keeper. (See photo 10.) Be sure to file a "flat" in the mount axle to anchor the keeper.

• **Main-gear guide plates.** These are made from 1/16-inch-thick aircraft ply. Cut a single plate to fit the bottom of the fuselage; then cut the grooves that define the outside plates. (See photos 11 and 12.) This yields three pieces: a center guide plate and two outside guide plates. The center guide plate holds the gear-down hard-spot block, and the outside guide plates hold the gear-up hard spots. (See photo 10 and illustration.) The center guide plate's width is determined by installing the main-gear legs (with wheels attached) on the swing-arm plate and letting them hang down in parallel so that the wheels touch. The center plate must fit between the legs without touching. The grooves between the center and outside guide plates must allow for friction-free travel of the gear legs.

The guide plates guide the main gear during the middle of its up/down travel. The "hard spots" guide the main gear during its first few inches of up-travel and the last few inches of down-travel. The vertical guide plate (which is located at the forward edge of, and is perpendicular to, the center and outside guide plates) guides the gear during the last few inches of up-travel and first few inches of down-travel. (See photo 11.) The 1/16-inch-ply vertical guide plate also supports the cabin floor directly above. In the Aerostar, install a 1/32-inch-ply cabin floor directly above the compartment that houses the retractable landing gear. The floor holds the motor packs or a fuel tank. (See photo 15.)

The center guide plate extends aft to the trailing-edge point and forward to a point that enables the retracted wheels to safely clear the guide plate by 3/8 inch. The guide grooves are cut parallel at the front edge of the guide plates. Near the aft end of the guide plates, the grooves curve 90 degrees toward the fuselage sides to allow for full extension of the gear.

• **Gear-down hard points.** These top outside edges of a small hardwood block are mounted atop the

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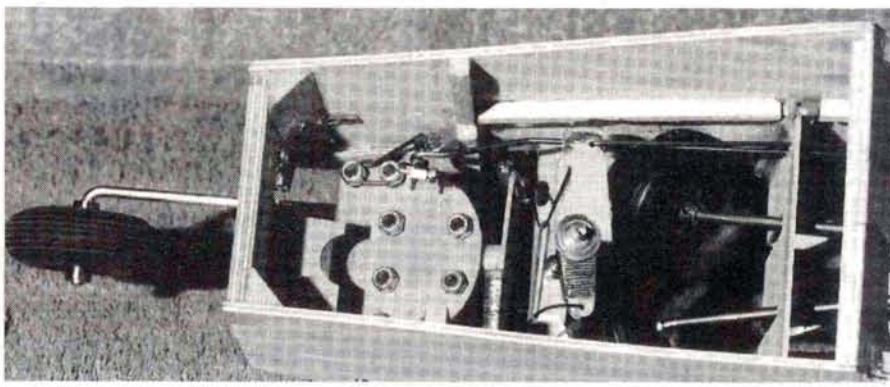
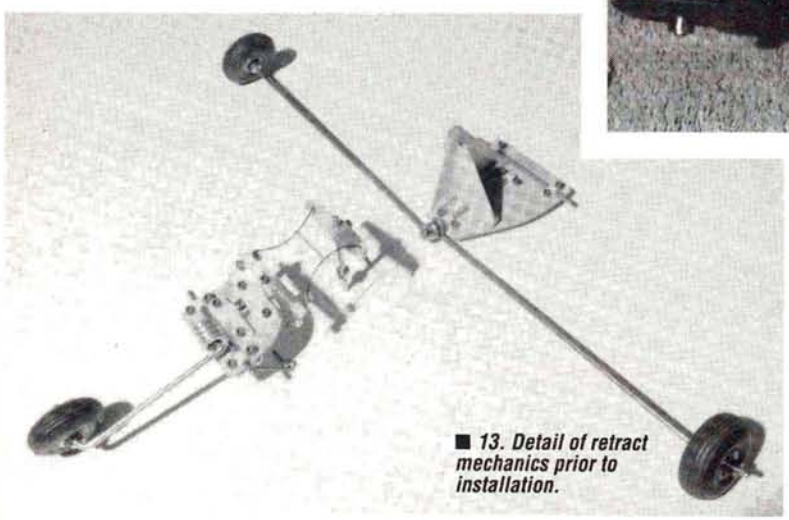
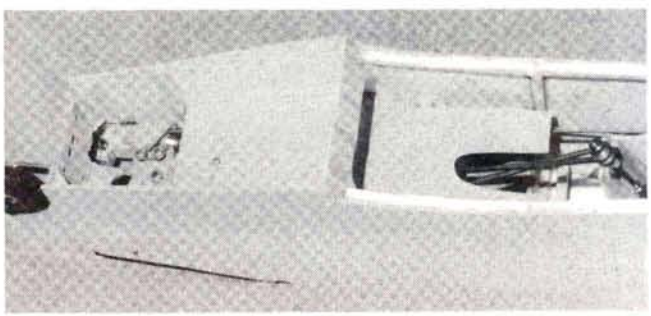




■ 13. Detail of retract mechanics prior to installation.

■ 14. Above: A top view of the idler arm, which is used for nose-gear steering. A piano wire push/pull rod connects the idler arm to the rudder servo, and another links both swing-arm plates (only the nose-gear plate is visible here). ■ 15. Below: Top view shows the cabin floor after installation. Center cutout allows clearance for the retracted main landing gear legs and mount axle.



1991 SCALE

★ ★ ★ CHAMPIONSHIPS

by RICH URAVITCH

LAS VEGAS, Nevada, is regarded by many to be *the* place to go for gambling casinos, nightlife and showgirls, and justifiably so. There are no clocks, no day or night—just endless activity; enough to dazzle the first-time visitor and still impress the repeat customer. A simple phone call will usually allow you to place a wager on nearly any sport, competition, or activity going on anywhere, except for the one I attended—the Scale Masters Championships.

For four days in October and

Left: Earl Thompson finished 7th with his magnificent Gloster Gladiator, and he walked off with several awards, including High Static Score (96.0), Best Military Aircraft and Best Plans-Built. He deserved them all! ■ Below: tanks for the memories! Bill McCallie jettisons the externals from his P-47D Thunderbolt.

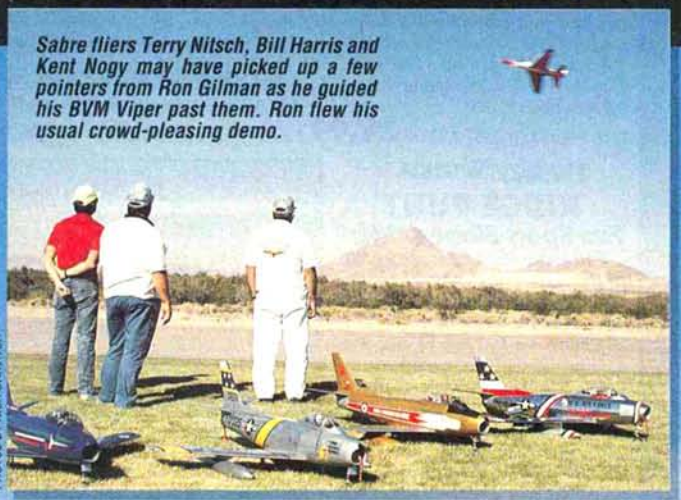
Left: flaps down, gear down, tail-wheel locked; Roger Young brings his C-47 over the numbers for a picture-perfect touchdown. ■ Right: Canadian modeler Guy Fawcett scratch-built his ST2500-powered Bristol F2B. This was an outstanding example of surface detail work. Its Static score was 90.5.

Left: the business end of David Pape's Kinner Sportster. Its detailing is impeccable—even more so when you realize that Pape built the 5-cylinder, 4-stroke radial engine by hand! ■ Above: Sisti's ST3000-powered P-47 taxies out for another late-afternoon practice hop.

Shailesh Patel ugly" is finish placards.

E MASTERS

ONSHIPS ★ ★ ★



Sabre fliers Terry Nitsch, Bill Harris and Kent Nogy may have picked up a few pointers from Ron Gilman as he guided his BVM Viper past them. Ron flew his usual crowd-pleasing demo.

PHOTOS BY RICH URAVITCH

Right: in this late-afternoon practice session, Roy Pratt restrained Tommy Weemes's Curtiss Hawk 75 while Weemes listened to it for any potential problems.

"With 60 of North America's best scale modelers competing, no one was taking any bets on the outcome!"

November 1991, some of the best R/C scale modelers in the country gathered to compete in what has become one of the premier events of its type in the country. The reason the bookmakers didn't participate may have been that the entrants were so closely matched and their entries were of such outstanding quality that a flip of the coin could have determined the winner! The participants earned the right to compete at this event through the Scale Masters Qualifier Program, which is structured to allow any flier to compete at a regional Scale Masters contest. Should he place well at the regional, he's invited to compete at the Championships. For many competitors, this invitation may represent a real travel commitment since, although the site changes, it's usually quite a distance away. In virtually every case, the prestige of participating and the possibility of winning overshadow any possible objection—except, perhaps, that of

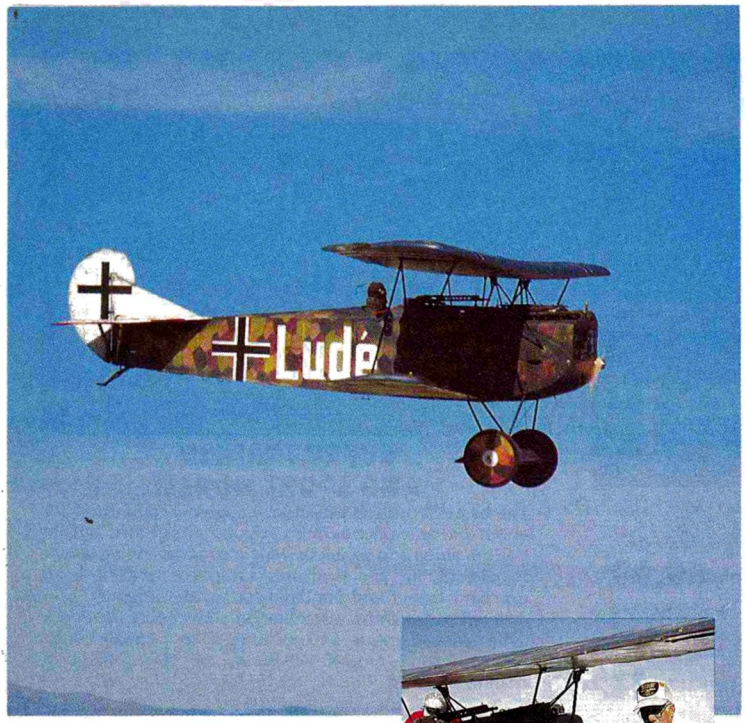
(Continued on page 70)

Jeff Micko checks out the flight controls on his P-47, which is powered by an ST3000 and controlled with a Futaba radio.

Left: the winner, Diego Lopez, performs some routine thru-flight maintenance on his Skyraider. Preparation and practice are the keys to winning.

'g F-4D pops the drag chute shortly after touchdown. Patel's "double-1 a Hawaiian Air Guard scheme right down to the stenciling and the

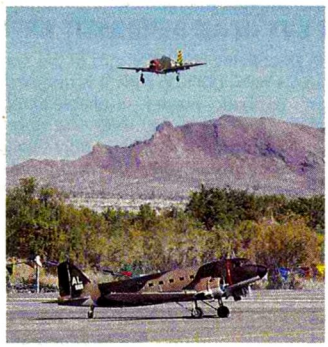
Right: Claude Tanner's ST3000-powered Maule M-6 Super Rocket is an understated airplane; the closer you get, the more impressive it becomes.



Long Islander Nick Tusa refuels his Quadra 65-powered, 1/3-scale Fokker D-VII. Nick is a serious competitor, and he campaigned the D-VII at the Nats, Rhinebeck and the Scale Masters Qualifier before he brought it to Las Vegas.

the "spousal majority." That, too,was probably eliminated this year by the lure of Vegas!

Participants and spectators



Roger Young clears the active with his C-47 while George Sisti lines up his Jug "Shimmy" on final.

alike couldn't have asked for better conditions for the event. CD Shawn Story and his band of merry men and women of the Las Vegas R/C Club did a superb job of organizing and executing the event. They even managed, along with the U.S. Scale Masters program originator, Harris Lee, to schedule the event's weather between two troublesome cold fronts. The weather was nearly perfect, and the site was the Circus Circus R/C Model Airport. That name wasn't chosen to capitalize on one of the most successful casinos in town; it was so named because the gentleman who owns that casino, Bill Bennett, built the flying site! He's a long-time modeler and has contributed tremendously to the hobby. He also sponsors another "little" event—the International R/C Tournament of Champions! If he ever decides to move east, we have a spot for him in our club!

The Championships were scheduled for four days with the first day, Thursday, being devoted to static judging and practice flying. Not surprisingly, many competitors used the time to get the feel of the field, sort out their engines (which may have potentially run differently at this new location), and work out any minor problems that could cause them to lose points in the competition. A few models sustained damaged during practice, but sufficient time remained to allow the necessary repairs. Five rounds were flown: two on Friday, two on Saturday and one on Sunday. After each round, contestants scrambled to the scoreboard, eager to find out how they had done and what new strategies might be required. These trips appeared to be fruitless; the competition was so keen that it wasn't until the final flight had been completed that one could be sure of the outcome.

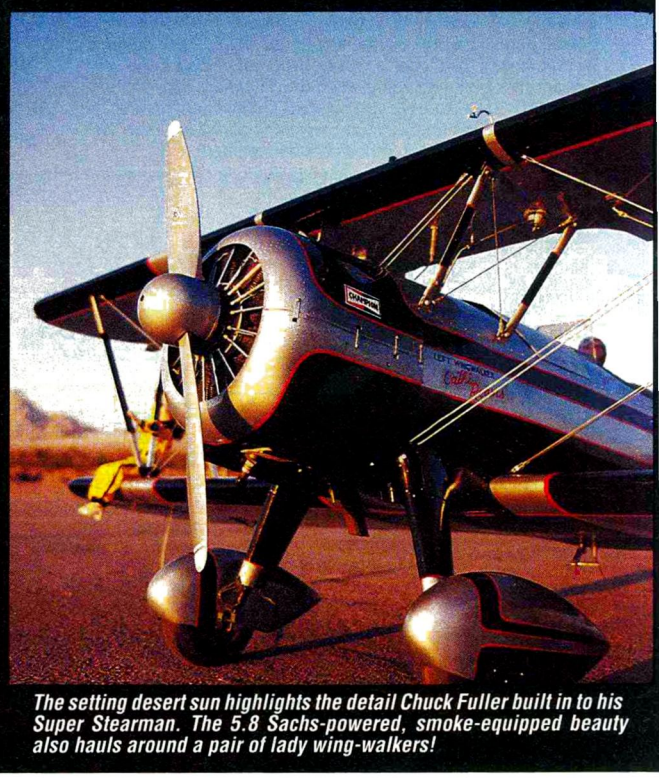
GLEAMING WINGS

Although all of the models were outstanding, a few stood out in my mind. Roger Young's C-47 from the Ziroli design was one of these; the sound of its twin Enya VT-240s was inspiring, and it gave me the same feeling I had when I first heard Mel Whitley's Sea Fury a few years ago. Gerry Fingler's OV-10 Bronco was another; this beautiful plane performed well, and it was heartbreaking to see it broken up in a crash. Shailesh Patel's F-4D Phantom was awesome as well. I understand that Patel has nearly as many F-4s as McDonnell Douglas built, and that's over 5,000! Even his practice airplane is an F-4—the smaller, single-engine version built from the Yellow Aircraft kit. I remember when he used to be a nice, mild-mannered Jug and Hellcat flier!

This was the year of Sabres and Jugs. Five F-86s and six P-47s were entered. All were built from kits, including the 62-inch-span

Despite his CD duties, Story still had time to help Ron Gilman prep his BVM Viper for the daily demo flights.

1991 SCALEMASTERS, AWARDS CHARTS



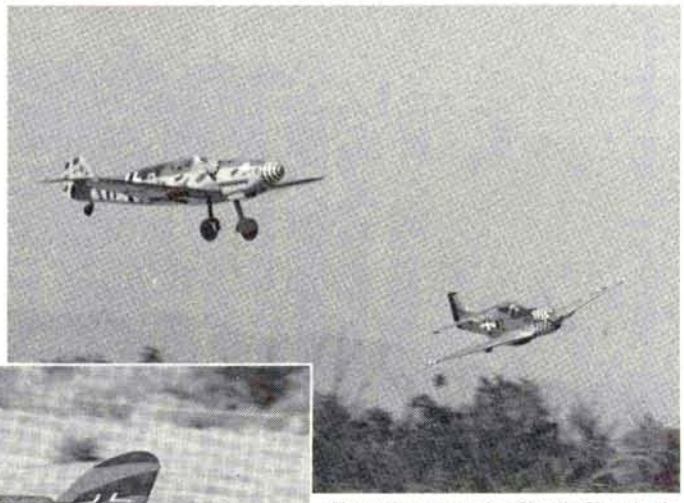
The setting desert sun highlights the detail Chuck Fuller built in to his Super Stearman. The 5.8 Sachs-powered, smoke-equipped beauty also hauls around a pair of lady wing-walkers!

P-47 entered by Bob Frey. Frey did a great job modifying what appeared to be a Top Flite kit. Most of the changes seemed to concentrate on the wing, which benefitted greatly from a slimming down of the airfoil. Although virtually all the models entered at this competition were large scale, Frey showed that a small, well-detailed, consistently flown model can hold its own against larger entries.

For you statistics watchers, the radios in use broke down like this: 27 Futaba; 16 Airtronics; 12 JR; the rest were Ace and Frey's "vintage" Kraft Signature Series. The most widely used engines were from O.S., followed by Super Tigre, Webra and Enya.

Military models are still the favorite subject: 41 of the 59 entries fell into that category. Of the 41 military entries, six were jets, five were of WW I vintage, and the rest were warbirds that spanned the period from the Golden Age to WW II.

After four models crashed into the dense thicket that surrounded the field, a police Hughes 300 showed up to assist. All aircraft were located and recovered.



Above: it appears that Charlie Chamber's Mustang has just put a burst into Larry Sutherland's BF-109G and is preparing to dive under him. ■ Left: it must have worked; Larry's "one-oh-nine" has just touched down and the right gear leg is parting company with the airframe. The wheel and tire are just visible behind the flap. Scale competition is approaching new heights in realism!

Far left: a few of the Canadian contingent (left to right): Gerry Fingler, Dave Sawatsky and Don Hatch. They're great guys—real competitors. ■ Left: the three event spark plugs—or is that glow plugs? (left to right): Harris Lee; Tom Nightingale, VP for Pacer Tech (the event's major sponsor); and CD Shawn Story, whose team made it happen. Super job, guys! ■ Right: think "small" models can't make it to the Scale Masters? This is Bob Frey's modified Top Flite P-47 Thunderbolt. It received a respectable 86.5 Static score.

TOP TEN FINISHERS

Name	Aircraft	Static	Total
Diego Lopez	AD-6 Skyraider	93.50	183.66
Don Hatch	Canadair CL-215	93.50	182.50
Charlie Chambers	P-51 Mustang	94.50	182.00
Terry Nitsch	F-86 Sabre	92.00	180.41
Bill Carper	P-47 Thunderbolt	92.50	179.91
Chuck Fuller	Super Stearman	93.50	179.25
Earl Thompson	Gloster Gladiator	96.00	179.16
David Pape	Kinner Sportster	94.50	179.08
Shailesh Patel	F-4D Phantom	92.50	178.83
Kent Nogy	F-86F Sabre	92.00	178.75

SPECIAL AWARDS

Award	Name	Plane
Best Plans-Built	Earl Thompson	Gloster Gladiator
Best Scratch-Built	Claude McCullough	Rawdon T-1
Best Kit-Built	Charlie Chambers	Platt P-51
Best Military	Earl Thompson	Gloster Gladiator
High Static	Earl Thompson	Gloster Gladiator
Pilots' Choice	Gerry Fingler	OV-10 Bronco
Best Civilian	David Pape	Kinner Sportster

Events like this are always informative. Just eavesdropping on modelers' conversations can teach you a lot, such as which kits are good, what modifications can be made to improve a model, sources of special materials and supplies and the latest techniques for everything from simulating rivets to duplicating rib stitching to finishing. You can learn it all here because the guys competing have done it, or at least know about it, and they're usually more than willing to pass it along. Many modelers attend events such as this specifically for that purpose. Scale modelers apparently even have their own university at which they either learn or teach all of this; at least, that's what the guys wearing the SMU sweatshirts told me.

HANGAR TALK

Despite the participants' highly competitive natures, it was evident that there was also a high degree of camraderie. The conclusion of each day's flying was followed by a get-together at the headquarters hotel where the fliers, their wives and the crews gathered to discuss new projects, tell "war" stories and just generally unwind to prepare for the next day. The highlight of these affairs was the Saturday night banquet at which the special awards were presented. Harris Lee received a standing ovation when Story introduced him. Lee recounted some of the early days, when the event was much smaller, and he traced its growth to the present level, commenting on how the quality of the models in competition has improved to the point of being

(Continued on page 94)

FLIGHT TRAINING

(Continued from page 33)

in New Mexico (I have moved again!) more than doubled in two years, and several of our new members are already training others. In the last five years, our new club—the Dayton Wingmasters—has gone from 30 to nearly 100 members, largely because of an increased emphasis on training.

Organize a comprehensive training program in your club; I think you'll find it will be worth the effort. Remember, "organized" doesn't mean "burdensome." Keep it fun, keep it safe, and keep it moving, because new members are the life of a club and of the sport of R/C.

[Editor's note: For readers who would like to get more detail on the training program described in this article, Steven Woodruff's address is 5530 Signet Dr., Dayton, OH 45424.]

**Here are the addresses of the companies mentioned in this article:*
Hitec, *9419 Abraham Way, Santee, CA 92071.*
Blue Sky Soaring, *7000 Soquel Dr., # 445, Aptos, CA. 95003; (408) 462-0607, (800) BLU-SKY1.* ■

EXTRA 300

(Continued from page 41)

a 12-ounce tank that will only give you approximately 7 minutes in the air with a 120. I decided on a 17-ounce Hobby Shack* tank that was designed for the Diablo 120. Hobby Lobby* offers an assortment of short, high-capacity tanks (approximately 17 1/2 ounces) made by Graupner* (part no. GR237) that are 4 3/4 inches long—an even better fit than the tank I now use.

I gave all the fiberglass and plastic parts (canopy frame) two light coats of Perfect Paint primer, followed by two coats of Pactra's* Formula-U white and bright red paint. The red matches Ultracote's* deep red fairly closely,

(Continued on page 73)

and I covered the entire plane with Ultracote deep red, deep blue and white.

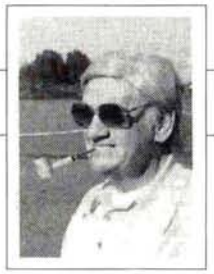
I knew the lettering on this color scheme would be my biggest problem, since there's bold lettering on almost every part of this aircraft. I called Vinylwrite* and they assured me that they could handle the task at hand. I sent them copies of my three-views and the dimensions of the letters required. Vinylwrite also wanted a piece of the blue and red Ultracote, which they matched perfectly in their lettering. One week later, I received the total lettering package. As usual, Vinylwrite came through for me with a perfect job. That night, I applied all the lettering. These finishing touches really enhanced the model.

RADIO INSTALLATION

The plans show the servo tray with the rudder, elevator and throttle servos and the receiver and battery pack mounted near the CG. This is the area for mounting the equipment for a .60 engine. Since I was using an FS-120 4-stroke engine, which is much heavier, I cut the servo tray to accommodate this modification and to fit it right up to the "slant" former. I mounted the battery pack on the shelf in the turtle deck between the slant former and former E . This gave me a balance point between the two bal-

(Continued on page 77)

GOLDEN AGE OF R/C



HAL DeBOLT

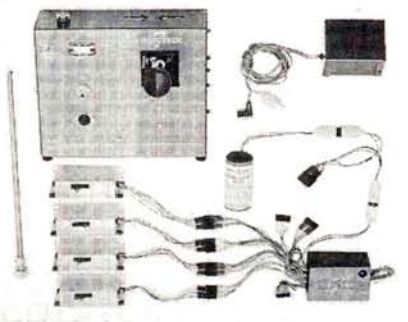
E-K LOGICTROL TALK

THANKS TO the help of a couple of OTers, we can talk about E-K Products of Irving, TX. During the '60s and '70s, E-K radios were among our most popular brands. Does the word "Logictrol" ring a bell? They were bright red, so they stood out in all the transmitter impounds.

My information is sparse, but with the help of George Ramey of Seattle, WA, and Alan Knight of Woodbury, NJ, I should be able to make a good start on the story. I had hoped to hear from Bob Elliott, but no dice on that one so far. If any of you have something to add, we'd all appreciate it.

BUFFALO BISONS

Bob Elliott's name is synonymous with E-K, he being the great leader throughout its existence. An electronic engineer, he was the designer of the circuits and probably determined all the concepts that were developed—many with unique features. The "K" in the name referred to Jerry Krause, who collaborated with Bob throughout many of the corporation's early years.



One of the first Logictrol propo systems offered seven channels. Servos were Bonner Transmites; the battery used wafer cells; the charger was separate.

My first acquaintance with Bob Elliott came at an early '50s Flying Bison R/C meet in Buffalo, NY. Bob lived in New England, but in those early days, R/C meets were few and far between, so if you wanted to attend, you had to travel—often hundreds of miles! The year before, Tom Parry, a displaced Bison, had returned home to Buffalo

For many years, the U.S. Navy was our Nats host. This 1965 publicity photo shows that many early R/Cers had vision. Note the jet-like pattern entry.

for a weekend and inspired this C/L club with a long afternoon of R/C flying.

Within the year, the Bisons had almost completely graduated from C/L to R/C. As meets go, this first Bison R/C contest was no great affair; probably a dozen or so new R/Cers having fun.

I hadn't seen Tom Parry since that time 40 years ago, but out of the blue, he showed up here for a short visit. It seems Tom has moved from one aerospace corporation to another, finally spending a number of years in Denver. He tells that, in the early days, he had the pleasure of flying with John Worth and his outstanding NACA group. Of course, at that time John was "control research" and contributed much to early R/C growth.

Bob Elliott's entry in that first Bison meet was a Schneider Cub equipped with Rockwood reeds—almost a duplicate of Alex' Schneider's Nats winner. Bob was obviously already an accomplished R/C flier, and he impressed us all with his performance.

After that, I lost contact with Bob for a while, but he was already developing R/C systems. Harvey Thomasian of Westboro, MA, told of test-flying Bob's early concepts for him while he was still in New England. So it appears that E-K originated in New England.

The next I heard of Bob, he was in California and was deeply involved with helping Howard Bonner develop his digital proportional systems, which were among the first to be commercialized.

How Bob's next adventure came about is a mystery, but one way or another, he wound up in Irving, TX, where he and Jerry Krause formed E-K Products. Their reason for choosing Texas could have been that they saw the advantages many major electronics manufacturers had found just across the border in Mexico. American electronics workers earned more than the Mexicans did, and the Mexican economy offered other incentives, too. It was advantageous to produce products on the Mexican side and import them, so though E-K Products was an American corporation, most production was in Mexico.

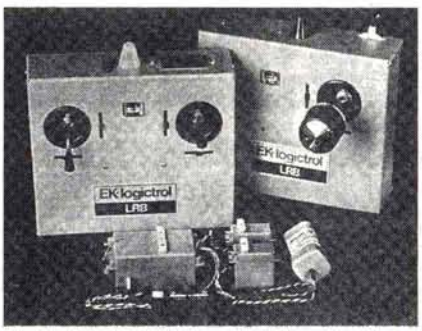
Like most American R/C endeavors, E-K started in a small way with one basic

system and then met the needs of R/Cers with a variety of concepts. Unlike others who had progressed through single channel to reeds (some to analog proportional) and wound up with today's digital system, E-K entered at the beginning of the digital era. You won't find an E-K reed or analog system on some dusty shelf or at a swap shop.

All R/C manufacturers labeled their systems by using the company name followed by a series name, e.g., Orbit 3+1 and Kraft Gold Medal Series. Not so with E-K; all its systems were Logictrol and identified as the Super Pro or Lab-7, etc. Thus, E-K was known to modelers as Logictrol.

LITTLE RED BRICK

Over the years, Logictrol's offerings expanded to cover the complete realm of R/C. A beginner's system could have been the Ranger—an inexpensive 3-channel that operated with dry cells. The transmitter represented the ultimate simplicity: it had a



The Logictrol LRB (little red brick) system. It was one of the last types offered by E-K Products.

single stick for directional and longitudinal control and a simple lever for the third servo. Wisely, trims were included. Even in this price range, three Super-Mini servos were supplied. These servos were standard with all Logictrol systems and advertised as the "world's smallest." Weighing only 1.2 ounces and providing 4 pounds of thrust, they were more than sufficient for any model up to giant scale.

Speaking of servos, a variety was offered in larger sizes, including one that provided linear output—something not seen today.

Space Control initiated the use of an integral airborne system that had the receiver, servos and battery all in one container that was simply bolted into the model. The utility of the concept was apparent, and its size and color quickly earned it the nickname of the "red brick."

The only other brand that latched onto this concept was Logictrol, which offered several versions. Interestingly, the basic model number of these systems was "LRB"—little red brick! The Logictrol airborne unit contained the receiver and either two or three servos; the battery was separate (a lesson learned from SC, where the battery weight in the unit made the brick a missile in a crash!).

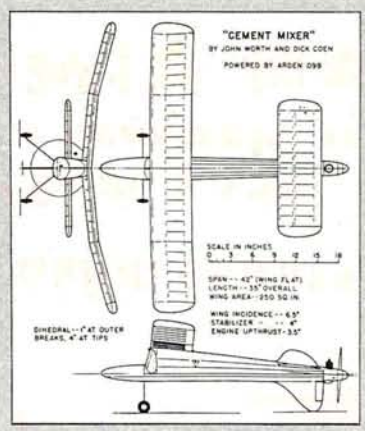
(Continued on page 107)

VINTAGE COMMUNICATION

For those to whom the Vintage R/C Society may be a mystery, I should say that it was instigated by followers of this column and formed by Joe Beshar and John Worth, who is now its president. The objective was to promote the building, flying and demonstrating of OT R/C models and to offer information concerning them—and to enjoy the camaraderie of others interested in our heritage.

I'm pleased to report that John and his staff have built the VR/CS into a healthy organization of several hundred members, including many of the R/C pioneers. So far, the society's theme has been low-key: follow what the members indicate they'd like. It does seem to work, but the potential is far greater, with the Society of Antique Modelers organization as an example.

We just received the 10th edition of the VR/CS newsletter, which was edited by Art Schroeder with his vast experience. Basically, these newsletters are about 15 pages filled with Society news and members' experiences. As an example, some of Carl Schmaedig's recollections of early happenings are hilarious! Technical matters abound also: an early unusual (even for today) design by John Worth; a detailed description of how Bob Kopski developed a converter so that he could fly a replica of his first R/C using a modern radio in the same pulsed fashion as the original. Pages of good stuff!



John Worth's "Cement Mixer"—a unique 1947 design developed to introduce the then-new light Aerotrol radio in "Air Trails" magazine. The SC, single-channel, Arden .09-powered design was inspired by the Douglas Mix Master bomber.

The Vintage R/C Society emblem.

One attribute of all organizations is activities, and the VR/CS has been busy with them. Beyond some regional fly-in demonstrations, there have been the Selinsgrove historical meetings, which have been outstanding and point the way to what can be done. There have also been some meetings/forums held with large general modeling events.

Another first for the VR/CS will be the R/C World OTR/C Reunion in Orlando, FL, on October 5 and 6. The many R/C pioneers who retired to Florida are expected to attend and add much flavor to it. For details, contact Ed Izzo, 196 Huntridge Way, Winter Springs, FL 32708.

For information on the Vintage RC Society, contact John Worth, 4326 Andes Dr., Fairfax, VA 22030.

EXTRA 300

(Continued from page 73)

ancing ranges shown on the plans without having to add weight to the rear.

It amazed me how fast the complete framework went together—two weeks of evening building. It took an additional two weeks for the covering and finishing, which was a little more involved than I had expected.

CONCLUSION

Each time I set up the Extra 300 at any field, a crowd seems to gather—everyone asking a multitude of questions and commenting on how beautiful it looks and flies. This makes all the time and effort I put into this project worthwhile. The Carl Goldberg Extra 300 is easy to build and a pleasure to fly. It can easily be built by an intermediate builder and, with a good .60 engine, it can be flown by a person with intermediate flying skills who wants to learn aerobatics. With a good, hot 1.20, its flight performance is astounding.

**Here are the addresses of the companies mentioned in this article:*
***Carl Goldberg Models,** 4734 West Chicago Ave., Chicago, IL 60651.*
***Superjet;** distributed by Carl Goldberg Models.*
***O.S.;** distributed by Great Planes Model Distributors, 1608 Interstate Dr., P.O. Box 4021, Champaign, IL 61824.*
***R/C City,** 96 Railroad Ave., Suisun, CA 94585.*
***Hobby Shack,** 18480 Bandilier Circle, Dept. HM012, Fountain Valley, CA 92728.*
***Hobby Lobby International,** 5614 Franklin Pike Cr., Brentwood, TN 37027.*
***Graupner;** distributed by Hobby Lobby.*
***Pactra Inc.,** 620 Buckbee St., Rockford, IL 61104.*
***Ultracote;** distributed by Carl Goldberg Models.*
***Vinylwrite Custom Lettering,** 16043 Tulsa St., Granada Hills, CA 91344.*
***Top Flite Models,** 2635 S. Wabash Ave., Chicago, IL 50616.* ■

AEROBATICS

(Continued from page 42)

new maneuver, do it always in the same direction until you're comfortable with it; then try it in the opposite direction. Don't practice too much (three to four flights a day is plenty), and try to think through the maneuver between flights. Even better, find an experienced flier who can help you with the maneuver. In closing, I again invite your questions; send them to me, care of *Model Airplane News*.

**Here's the address of the company mentioned in this article:*
***Powermaster Products Inc.,** 7807-H Telegraph Rd., Montebello, CA 90640.* ■

HELICOPTER CHALLENGE

CRAIG HATH

DEFINITIONS AND DECISIONS FOR THE BEGINNER

IN THE PREVIOUS edition of "Helicopter Challenge," I began (from scratch) to discuss how to get started in the sport of R/C helicopter flying. This month, I'll discuss how to choose the right equipment and how helicopters work.

THE RIGHT STUFF

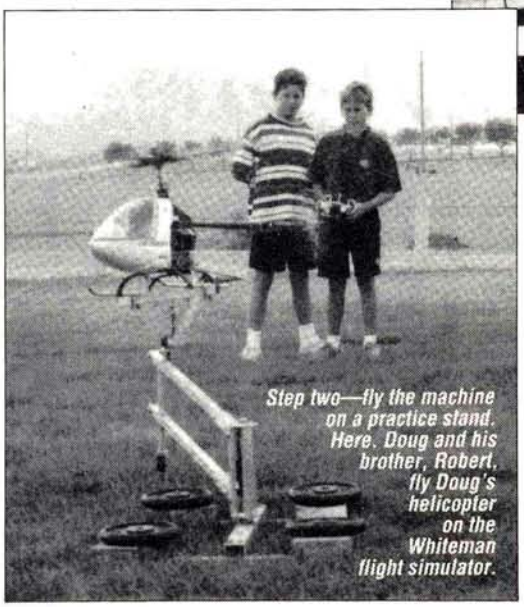
Choosing and buying the right equipment is critical to your early success. None of the model helicopter kits on the market is bad (in fact, the quality of most is respectable), but before you buy one, decide which type of flying you want to do, e.g., scale-model flying, competitive aerobatics, or "hot-dog" sport flying. Become familiar with the kits that are suitable for your type of flying, and then pick whichever appeals to you and fits your financial situation.

This brings up the touchy subject of money and the question: how much will I have to spend? I recommend that you buy the best equipment your budget will allow—especially a radio. A good radio system will enable you to perform the trim functions electronically instead of mechanically. (I'll cover this in detail next time.) It will be well worthwhile, and you'll be happy with it for much longer.

To get started, plan to spend at least $1,000, but please don't let that figure scare you away! There are things you can do to accommodate a tight budget, e.g., buy a used machine, or buy the kit first and then the engine, radio, etc., when you can afford them. After the initial investment, you won't spend a lot unless you habitually crash or go on buying binges (as many of my flying buddies seem to do).

THE WAY THINGS WORK

Before I discuss which models best fulfill specific needs, I'll cover the theory of how helicopters work. Understanding some of the basic helicopter terms will help you to make educated decisions about which machines to buy.



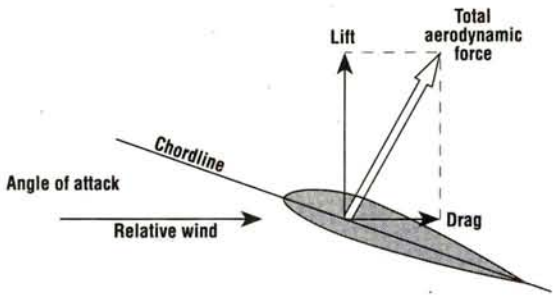
Step two—fly the machine on a practice stand. Here, Doug and his brother, Robert, fly Doug's helicopter on the Whiteman flight simulator.

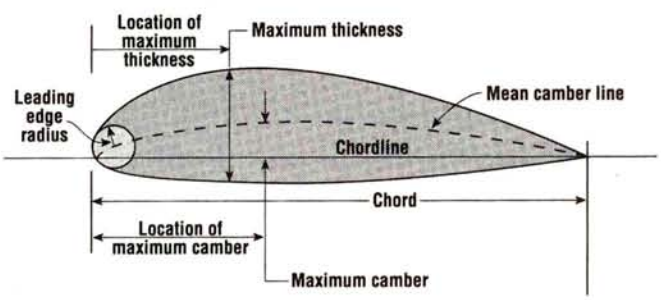
Above: Doug Banich is learning to fly the "Heli Challenge" way. Step one—use the R/C Aerohopper to get the basic control responses and "muscle memory" down.

Lift is the force that's necessary for flight. A helicopter's main-rotor blades spinning through the air with sufficient speed will generate the force that's necessary to lift the helicopter off the ground. The "lifting surface" that does this is called the "main-rotor disk," and it consists of blades that are angled upward so that the helicopter will *rise* when lift is generated. This angle is known as the "angle of attack" or "blade pitch." Sometimes, it's set in one position (fixed pitch); other times, it's varied using a control system (collective pitch).

The engine's torque is the force that "twists" the rotor disk into motion and causes it to spin through the air. The torque also causes the framework, which houses the engine and the control system (and the pilot and the passengers in full-size heli), to turn in a direction that's opposite that of the main-rotor disk. The tail rotor—a smaller version of the airfoil used on the main rotor disk—counters this. It generates thrust that's aligned with and in opposition to the main rotor's torque.

The tail rotor's angle of attack or pitch is variable so that the helicopter can be controlled about its yaw axis. "Yaw" is the term that's used to describe the helicopter's sideways motion, and the yaw axis runs through





the center of the main-rotor shaft. (On a fixed-wing plane, you use rudder to control yaw.)

On a helicopter, you control two other flight axes: pitch and roll. Pitch simply refers to the position of the nose, i.e., whether it's high or low. Roll refers to the angle of the main rotor disk, i.e., to the left or right. (These controls are similar to elevator and aileron on fixed-wing aircraft.)

You can vary the pitch and roll axes using stick commands to adjust the pitch of the main rotor blades and/or the stabilizer blades precisely. This is called "cyclic-pitch control," and you use it to steer the rotor disk in the direction you want the helicopter to fly. You use all of these controls—cyclic-pitch, collective-pitch, throttle and yaw—to get the helicopter to hover, climb, descend and fly at just about any angle or in any direction.

COLLECTIVE- VERSUS FIXED-PITCH

There are two schools of thought about whether novice pilots should use collective- or fixed-pitch helicopters. I think it's better to learn to fly using a collective-pitch helicopter. They have outstanding throttle response and, if they're set up and trimmed properly, their flight characteristics are good. Collective-pitch helicopters also respond to throttle input instantaneously, so they're much easier to control.

To control lift on fixed-pitch helis, you vary the rotor speed. This means that you must be able to operate the controls quickly (staying "ahead" of the machine) because you have to wait for the rotor disk to speed up or slow down. Although fixed-pitch systems aren't as complex as collective-pitch systems, i.e., they're easier to set up, they're practically incapable of performing aerobatics and autorotations.

That's enough food for thought. Next month, I'll discuss which machines are best for novice helicopter pilots and the flight performances and capabilities of specific models. I'll also cover some of the basic features of modern heli radio systems. ■

ROTARY-WING ROUNDUP

NEW HELI PRODUCTS

KALT
30-Size Float Set

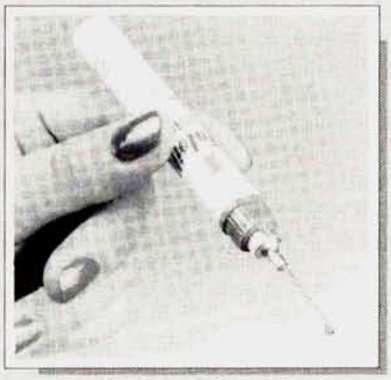
Kalt's new float set is an ideal accessory for any 30-size heli. The floats are made of tough vinyl with heat-sealed edges. The set comes with pre-cut hardwood supports and a hardware pack. These floats are excellent training gear for novice pilots, and experienced fliers will enjoy using them on water and snow. They weigh 19 ounces and are 19 inches long.

Part no. K26006

Price: $49.99

For more information, contact Kalt/Hobby Dynamics Dist., P. O. Box 3726, Champaign, IL 61826; (217) 355-0022.

Descriptions of new products appearing on this page were derived from press releases supplied by the manufacturers and/or their advertising agencies. The information given here does not constitute an endorsement by **Model Airplane News**, nor guarantee product performance or safety.

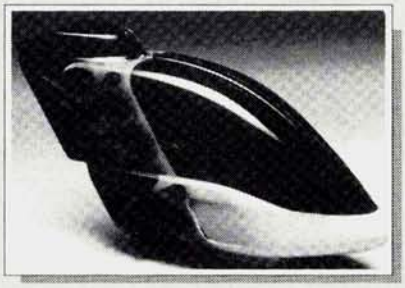


SYON CORPORATION
Lubit-8® Pen Oiler

The Syon Lubit-8® Pen Oiler is ideal for maintaining a wide variety of products—from scientific instruments to cameras, guns and fishing tackle. It's filled with a blend of natural and synthetic oils that contain particles of Teflon® and Fluon®, and it has a needle tip that dispenses lubricant precisely, one drop at a time. The lubricant is very slippery, resists dust, doesn't coagulate, leaves no oily residue and is unaffected by temperature. Use this fountain-pen-sized oiler where sprays and oil cans are impractical.

For more information, contact Syon Corporation, 280 Eliot St., Ashland, MA 01721; (508) 881-8852.

HEL-X CORPORATION
Yale Vacu-formed X-Cell 60 Canopy



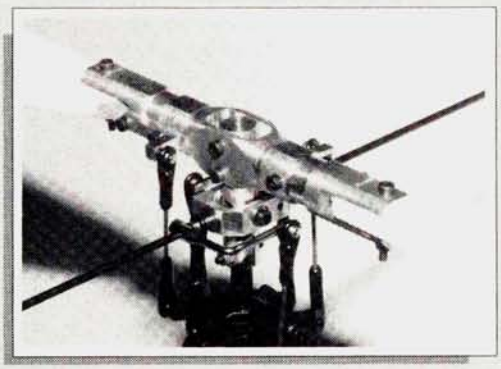
This canopy was designed for the X-Cell 60. Its color scheme makes a great impact: a gradual transition from white to yellow to bright orange in an exciting flame pattern that contrasts sharply with the jet black aft section. All paint has been applied to the inside of the canopy (including the tinted windscreen).

Part no. 1136

Price: $179

For more information, contact Hel-X Corporation, 558 Highland Ave., Upper Montclair, NJ 07043; (201) 744-4962.

TECH SPECIALTIES
Mini Elite Rotor Head



Tech Specialties' new Mini Elite Rotor Head can be bolted onto the Kyosho Concept or the Hirobo Shuttle without any modification to either machine. It has all-metal construction, a one-piece feathering spindle, precision ball bearings and all the pushrods and ball links you'll need for installation. An optional thrust-bearing kit is available for those who run extra-heavy blades. Use the Mini Elite on the Shuttle with the stock washout and swashplate, or with Tech Specialties' new, metal washout and swashplate. On the Concept, you must use the stock mixer, but you can substitute the metal swashplate for the plastic one.

Part nos. 950EHC (Concept version); 950EHB (Shuttle version); TS-153 (metal washout); TS-155 (metal swashplate); TS-156 (optional thrust bearing kit).

Prices: $179.95; $199.95; $69.95; $69.95; $39.95.

For more information, contact Tech Specialties, 218 Vernon Rd., Greenville, PA 16125; (412) 588-1335.

GILBERT APPROACH

(Continued from page 57)

wind leg all the way to the runway. You're trying to achieve a full stall just inches above the runway. If the plane passes through the key point too rapidly, it will overshoot the runway, in which case, you should perform a go-around. If the plane is below the key point, it will crash; as soon as you see that you have insufficient altitude, throttle up and go around.

When you've mastered going through the key point with the throttle closed and at just above stall speed, you're ready to move on to the next step.

• **Landing...at last.** If you've really practiced the approaches and go-arounds, you'll have no trouble with landings. Just continue through the key point with throttle off, and feed in a little more "up" to cause the aircraft to stall when it touches the runway, i.e., flare. That's all there is to it! If the aircraft starts to veer off to either side and there's sufficient runway, apply some throttle and correct the rudder. Again, applying less than full throttle will help to keep the plane on the ground.

Touch-and-go's are easier to manage if you feed in some throttle a few inches before touchdown. This keeps the prop turning through the grass—and possibly the dirt—and gives you much better rudder control when the plane leaves the runway.

• **Handling the wind.** When landing in a substantial head wind, the base leg will be in a little closer, and the final approach leg will be steeper. Don't be afraid to point the nose downward to keep the speed up. It may also help to maintain a little power until the plane is about a foot above the runway.

I hope these steps are helpful. Drop me a line in care of *Model Airplane News,* and let me know what you think. I'd love to hear from you. Remember: no crashes allowed; keep 'em flying. ■

RETRACTS

(Continued from page 62)

center guide plate, flush with its sides. The hard-point block nests against the center guide plate and the front face of the down-lock cross brace. (See photo 10, where this block is partially obscured.) The gear-down hard spots serve as a fulcrum to splay the gear legs from parallel alignment into their fully extended position. The swing-arm plate-mount axle rests on this block when the gear is extended. The angles that should be cut are roughly diagrammed in the illustration but, for these to serve as a fulcrum, you must customize them during assembly, which is fairly easy to do.

• **Gear-up hard points.** The 1/16-inch-

(Continued on page 82)

RETRACTS

(Continued from page 81)

aircraft-ply gear-up hard points are the most difficult part of this project to describe. Although they look like flanges, they serve as a fulcrum to guide the main-gear legs into parallel at the beginning of the retraction arc. (See photo 10 and illustration.)

ACTUATION

• **Interconnecting the main gear and nose gear.** The nose-gear swing-arm plate is connected to the main-gear swing-arm plate by a push/pull rod. I recommend .0625-inch-diameter piano wire for the push/pull rod, because it's strong enough to operate the nose gear, but weak enough to bend if any parts should jam. Mount a horn on the main-gear swing-arm plate as shown. Bend the front end of the push/pull rod into an eye that fits over a perpendicular piece of the same diameter wire that's affixed to the nose-gear swing-arm plate. This should be customized: the idea is to create a pivoting, slop-free connection that can absorb some shock during landings.

After you've finished the main gear, glue in the bottom mount brace for the steering idler shaft. Mount the top of the idler shaft to the cabin floor.

Connect the double-armed horn on the nose strut to the double-armed horn on the idler shaft with pull/pull steering cables made from 30-pound-test shark leader. After you've completed these steps, install the rudder and elevator servos behind the trailing-edge bulkhead, and then install a nose-steering push/pull rod (use .0625-inch-diameter piano wire) from the idler arm to the rudder servo. (See photo 14.)

If you want to simplify the mechanism, you can mount a Cannon* servo directly onto the nose swing-arm plate for steering, and connect your radio to it and the rudder servo with a Y-harness (not shown). This eliminates the idler arm, its axle and the rudder-servo-to-steering-arm linkage. Your retracts will weigh .7 ounce less, and the assembly will be slightly more durable.

• **Retract actuation servo.** To actuate the main-gear swing-arm plate, use a Futaba* sail-winch servo (or the equivalent). This 2.5-ounce servo is about one third as fast as the average servo, and its 129 ounce/inch torque adequately handles the job. Place the winch servo well aft of the trailing edge, elevator and rudder servos. This provides space in the cabin for aileron and gear linkage and for motor flight packs. Connect the winch servo to the main-gear swing-arm with a push/pull rod (use .0625-inch-diameter piano wire). It will be the second rod connecting to the main-gear swing-arm horn. (See illustration.)

From this point, construction of the Aerostar is straightforward. (I also modified my Aerostar by using the NACA 0012 airfoil and by eliminating dihedral so that the plane would fly

(Continued on page 83)

RETRACTS

better inverted). Make sure that the aileron linkage clears the main-gear swing-arm throughout its up/down travel.

TRIM AND ADJUSTMENT

I quickly found that spraying the hard spots with silicone greatly improved the gear actuation, perhaps halving the torque required from the winch servo. I spray this area with silicone before each flight day, and do a test retraction cycle before each flight.

FLIGHT TEST

During my first flight, everything worked correctly, and the touchdown was smooth. Two things were noteworthy:

- There was a perceptible forward CG shift as all three gears folded forward and up to retract. This wasn't excessive—just noticeable.
- The airplane definitely accelerates when the gear is retracted, and it also glides much flatter.

It sure was a great feeling to see that gear go up after four months of work—even better to see it come down!

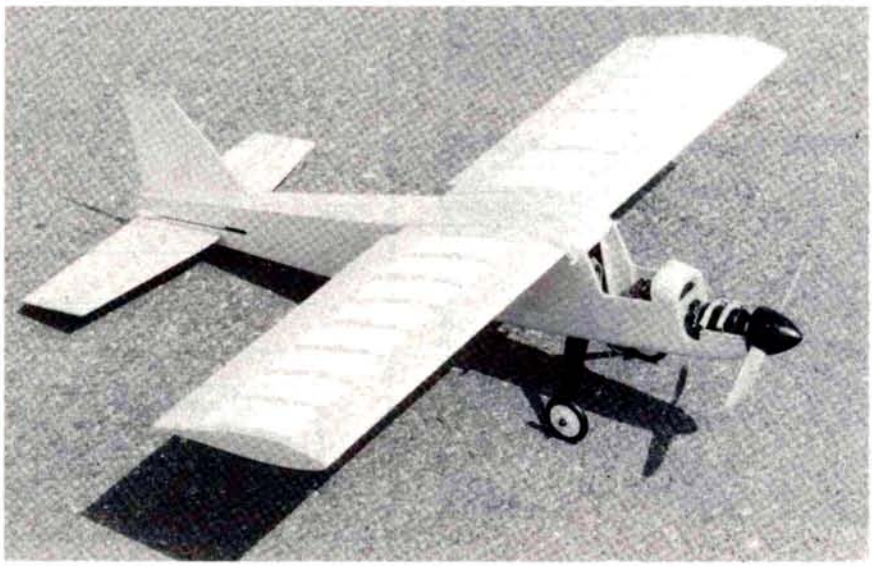
The second flight was just as smooth until touchdown, when I didn't correct quickly enough for a wind gust, and it landed very hard—nose wheel first. This broke the nose strut off its swing-arm plate, but with $1.75

(Continued on page 94)

QUIET FLIGHT

JOHN LUPPERGER

CONVERTING AN SST, PLUS SLOPE-SOARING BASICS



The framed-up model is attractive and for a high-winger, it has a sporty look. The cabin area will be covered with clear acetate.

I HOPE YOU'VE been working on your 1/2A SST electric conversion this past month. In this month's column, we'll finish the wing and show you how and where to install your flight gear. This has really been an enjoyable project for me, as the 1/2A SST turned out to be such a good choice for electric conversion. This isn't a plane for everyone; it will require that you have aileron experience, a cobalt motor (or a fairly hot-wind ferrite one) to perform well. I've flown one with an FAI cobalt 05, and it was quite fast and aerobatic.

Anyway, let's finish up the wing! This is the really easy part in terms of modifications; there aren't any until you get ready to fit the ailerons. Build each panel exactly according to the plans. This type of leading- and trailing-edge sheet and capstrip construction produces a very light structure. It isn't as strong as a fully sheeted wing, but it's strong enough for sport flying. The plan recommends 3/16 inch dihedral under each tip, but I made my wing flat. Since it has such a short span, it doesn't have the usual drooped-tip look that's associated with a "no-dihedral" wing.

After the two wing panels have been joined with epoxy, substitute the 1-inch-thick trailing-edge stock for the 1/2-inch-thick stock supplied in the kit. Make the two center section pieces that will house the aileron horns according to the plan, and glue them to the trailing edge of the wing. Position the wing panel on the fuselage, and mark off the amount of trailing-edge material that will have to be removed from the center section (approximately 1/2 inch).

Use another piece of trailing-edge material at each wing tip (according to the plans), and then cut each aileron to length. Bevel the leading edge for a center hinge line, and drill the hole for the torque rod. Either cut two new wing tips out of 1/8-inch-thick sheet, or add a piece of scrap to the tips in the kit, to bring them up to the new tip-chord dimension. Finally, use a piece of 1 1/2- to 2-inch-wide fiberglass tape to reinforce the wing's center section. Apply it with slow curing epoxy, or glue it directly to the center sheeting with thin Zap*.

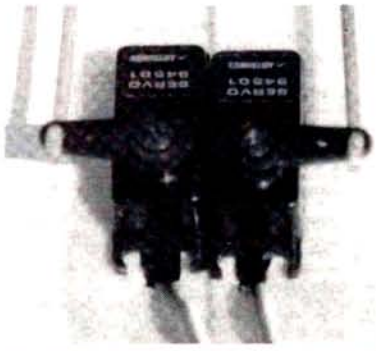
It's really easy to mount all of the radio and flight gear in the the 1/2A SST's fuselage. Mount the elevator servo (use a microservo or a miniservo) in the position shown on the plans, but lay it on its side (use a side mount tray or mount it with servo tape). Make the elevator pushrod out of 3/16-inch-diameter dowel or hardwood and two pieces of threaded rod. Bind the rod to the dowel with thread, and attach it to the servo and the control horn with a clevis. The receiver can be mounted on the fuselage bottom with Velcro®, just in front of the elevator servo.

Glue two hardwood rails (each slightly shorter than the length of the saddle area) to each fuselage side. Glue them just above the height of the servo arm and the receiver. Cut a piece of scrap 1/16-inch-thick plywood or hard 3/32-inch-thick balsa sheet that's the same length as the hardwood rails, and will fit between the two fuselage sides. Place the sheet on the rails, and drill a hole at each corner so that you'll be able to attach the sheet to the rails with small screws. The flight batteries will be mounted on this sheet with Velcro®. This leaves plenty of clearance for the aileron servo and aileron linkages.

Mount your speed controller, on/off relay, or servo and microswitch on the tank floor with Velcro®. If you're not using a battery-eliminator circuit (BEC), place your 100 to 250mAh flight pack under the tank floor.

Make a cutout for your aileron servo (micro or mini) in the center of the wing. Remove enough foam to allow the servo-mounting lugs to lie flush with the center sheeting. Put a piece of thin servo tape (the type used by R/C car enthusiasts) in the bottom of the cutout. Push the servo down onto the tape to secure it

(Continued on page 86)



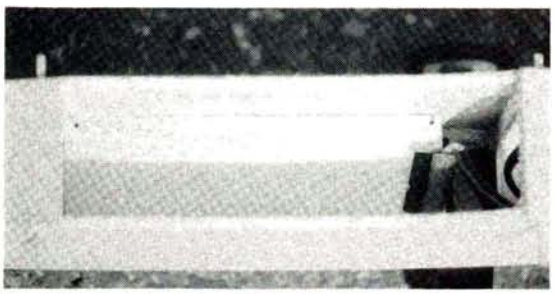
The aileron servo fits into a cutout in the wing center section. My model has two servos for flaperon operation.

(Continued from page 84)

in the wing. Make your aileron pushrods out of 1/16-inch-diameter threaded rod, and connect them to the aileron horns with clevises and to the servo with a Z-bend.

Now, all that remains is to finish the model with your favorite covering, glue on the tail group, and mount your motor. Unless you fly off a grass field, I recommend that you use the optional landing gear to save the fuselage bottom from undue wear and tear.

I'm going to test-fly my 1/2A SST with an Astro* cobalt 05 and a 900mAh 7-cell battery pack. After initial test flights, I'll switch to a modified ferrite motor. I'm going to keep coming down in power until I find the least powerful motor that will fly the model properly. As you see it in the pictures—with motor, prop, spinner, speed controller, three servos, 7-channel receiver, 250mAh airborne battery, and 7-cell 900mAh flight pack—my model (prior to covering) weighed 35.5 ounces. Add a couple more ounces for covering (let's say 38 ounces total), and the model will have a wing loading of about 21.8 ounces to the square foot.



The battery tray is made of 1/16-inch-thick plywood and is attached with four small screws (one in each corner).

I could drop 1/2 ounce by running only one microservo for the ailerons (mine is set up for flaperons); another 1/2 ounce by switching my elevator servo from a mini to a micro; at least one more ounce by switching my 7-channel receiver for a 4-channel micro; and about 2 more ounces if I used a speed controller with a BEC. I could also drop a couple more ounces by removing the landing gear. All of this weight reduction would bring the flying weight down to 32 ounces. So, you could conceivably build your model with a wing loading of 18.3 ounces to the square foot.

I'll pass on the results of the motor testing next time.

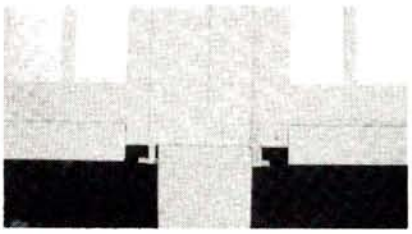
BASICS OF SLOPE SOARING

In previous columns, we've discussed what kind of hill you should look for and which type of model you should fly. Let's assume that you've chosen a basic, 2-meter polyhedral model with rudder and elevator controls.

The first thing you have to learn is how to turn your model on the slope. There's a band of workable lift on any slope; too far out in front of this band and you'll lose lift, too far back, and you'll not only lose lift, but you'll also generally encounter turbulence. The lift area is usually just a little out from the edge of the top of the slope, but how far out, up and down it extends will vary with the shape of the hill and the strength of the wind.

When you're learning, all turns should be made away from the hill. A downwind turn could cause your model to be pushed back into the area of turbulence.

As the model turns, it will be necessary to add a little opposite rudder input to prevent the model from continuing its turn (i.e., so it will continue in a straight path across the face of the slope). The idea is to make a narrow figure-8 pattern across the face of the hill. Practice until you can make repeated turns without leaving the band of best lift.



The wing center section shows how much longer and wider the ailerons are than the original. The stock ailerons ended flush with the wing saddle area.

Naturally, the next maneuver that you'll need to learn is landing. This is obviously the most important part of your flight—at least if you want to fly your model again!

Start your approach with a turn back over the face of the hill. Let's assume that your first turn is left. Allow it to fly downwind a little way past your landing zone. How far you go past the landing zone will depend on altitude, wind strength and the shape of the landing area (be careful; if you go too far back, major turbulence may be encountered). When the model is making the downwind leg, it will start to lose altitude and be a bit "mushy," because its air speed may be getting close to the actual wind speed. It may be necessary to add a little down-elevator to prevent a stall.

The next left-hand turn should be made with a minimal amount of up-elevator. If too much "up" is used, the model will slow down and be pushed sideways down the back of the hill. A little down-elevator should be held to keep the model's air speed up and to keep the rudder control positive.

The last left-hand turn should be made primarily with the rudder (i.e., without much up-elevator). This will cause the nose of the model to point downward in the turn, and up-elevator should only be applied if the model is losing altitude too quickly. If too much up-elevator is applied, the model could stall, or balloon upward and lose air speed. The final part of the landing approach is very dependent on the wind strength and amount of turbulence encountered in the landing zone. If there's a lot of turbulence, it will be necessary to feed in quite a bit of down-elevator to force the model through the rough air and end in an up-elevator flare just before the model touches down.

If the air in the landing zone is fairly smooth, the final part of the approach can be a lot of fun. As the model starts to make the last leg, let it float in—even adding a small amount of up-elevator. If you can match the amount of up-elevator to the strength of the wind, you can actually make a vertical descent that will end with this model gently touching down with little or no forward ground speed at all! Hope this gets you off to a good start in your first attempt at slope soaring.

Till next time—good thermals and a full charge!

**Here are the addresses of the companies mentioned in this article:*
Zap; *distributed by Frank Tiano Enterprises, 15300 Estancia Ln., W. Palm Beach, FL 33414.*
AstroFlight Inc., *13311 Beach Ave., Marina Del Rey, CA 90292.* ■

MODEL AIRPLANE NEWS MAGAZINE
FIELD & BENCH REVIEW

Javelin and JR Max 6-channel radio.

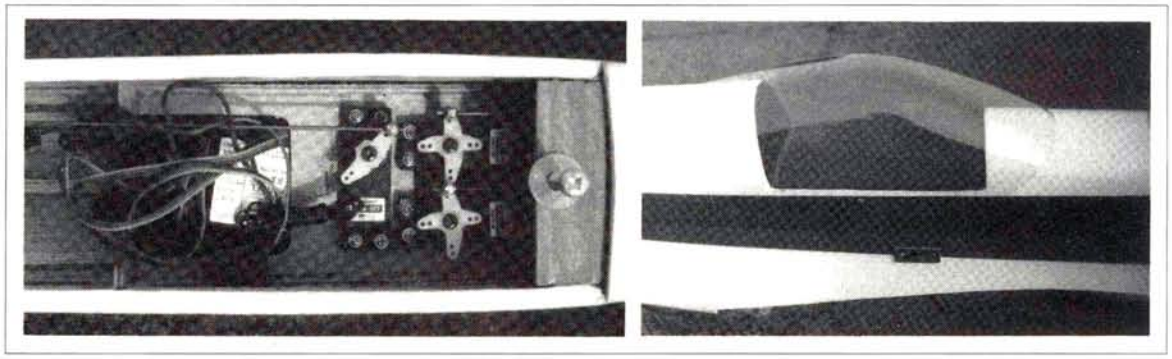
Quick and slick

MINICRAFT

JAVELIN ARF

by TIM DIPERI

WHAT'S PINK, purple, red and white, fast and sleek and easy to build? Minicraft's new, all-wood, ARF Javelin—a .40- size sport pattern ship imported exclusively by Cermark* and distributed by Horizon Hobby Distributors* as well—has these and other features that will appeal to aeromodelers who want to spend more time at the flying field and less at the workbench. It will also appeal to those old-schoolers who prefer built-up wooden airplanes.



■ *Right: here, you can see how the servo was installed in the fuselage. Note the single wing hold-down bolt.*
■ *Far Right: canopy detail (the wing has been removed).*

The Javelin comes with two covered wing halves with hinged and mounted (but not glued) ailerons. The fuselage is also complete; just mount the vertical and horizontal tail fins. The tail feathers are factory hinged. The kit contains a two-piece plastic engine cowl, two, two-piece plastic wheel pants and a pre-built wooden engine mount. The hardware package includes wheels, a fuel tank and all pushrods. You must supply the fuel tubing from the tank, two clevises and a propeller. Colorful decals are provided.

A 12-page construction guide is included. Like those in many kits of this type, the manual has a bare minimum of instructions. There are over 20 helpful, detailed sketches. I would rate this manual, for this class of model, a B-.

WINGS

The foam-core wing halves come balsa-sheeted and covered with white, iron-on covering. Where the two wings join, there are thick, wooden ribs that have been factory sanded to the required dihedral. Simply apply epoxy to the 12-inch-long, plywood spar and the wooden ribs to build the wing. Using CA instead of epoxy or resin, I fiberglassed the entire center section of the wing, and then I ran the white tape around the center section. I used thick CA to attach the hinges, but I used 12-minute epoxy where the torque rod is inserted into the aileron.

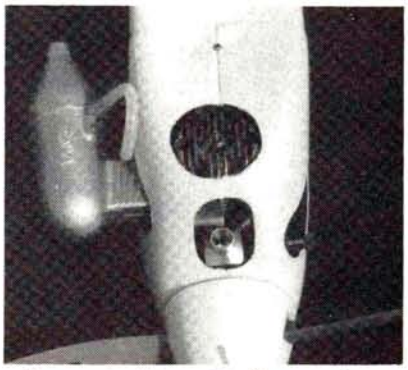
FUSELAGE

The fuselage comes almost completely finished. The engine mount is made of plywood and is of box construction. I painted the entire engine mount and firewall with Hobbypoxy* epoxy finishing resin to provide extra strength and fuelproofing. I secured the vertical fin and the horizontal stabilizer with epoxy. I then used thick CA to fasten the hinges and the tail-wheel bracket. Finally, the control horns, which are supplied, were installed.

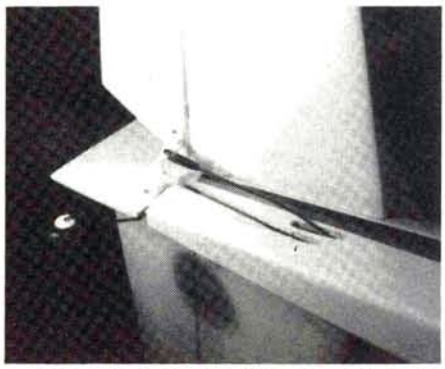
The pushrods are made out of light balsa dowels, approximately 1/4 inch in diameter. Threaded rods must be attached to the balsa dowels. (Use epoxy and thick, heat-shrink tubing.) The elevator pushrod uses two threaded rods—one for each half of the elevator.

RADIO

I installed a JR* Max 6-channel radio and secured the JR NES 507 servos to the factory-



You must cut the cowl to fit your engine.



Bottom shot of the tail. Notice the tail wheel and rudder/elevator pushrod connection.

SPECIFICATIONS

Name: Javelin
Manufacturer: Minicraft (imported by Cermark Electronics)
Type: Sport/pattern ARF
Price: $229.95
Wingspan: 58 inches
Wing area: 596 square inches
Wing loading: 25.6 ounces/square foot
Weight: 6 pounds,10 ounces
Length: 51 inches
No. of channels: 4 (rudder, elevator, aileron, throttle)
Radio used: J.R. Max 6

Power req'd: .40-.60 2-stroke; 48-.70 4-stroke
Engine used: Enya .40
Prop used: Master Airscrew 10x6
Airfoil type: symmetrical (washout not built in)
Wing construction: balsa-sheeted foam cores
Kit construction: built-up wood

Features: this kit includes balsa-sheeted, plastic, film-covered, foam-core wing halves; a built-up, covered fuselage, built-up, covered vertical and horizontal tail fins (unmounted); an ABS plastic cowl and wheel pants; wheels; a fuel tank; pushrods; and decals.

Hits
- All-wood, light, built-up, film-covered fuselage and tail feathers
- A true sport/pattern plane with good flight performance

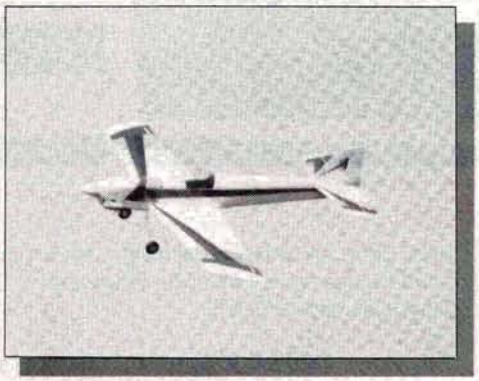
Misses
- Decals, though attractive, tended to lift soon after they had been applied.
- Tank mount is slightly high in relation to the inverted engine.

FLIGHT PERFORMANCE

The engine is mounted inverted on the Javelin. During the engine break-in period, I found that the fuel tank was a little high in relation to the carburetor. The needle valve is positioned approximately level with the bottom of the fuel tank. This caused the engine to flood on several starts. At low rpm settings, the engine also tended to load up when the tank was full. I had the most success when I started the airplane inverted, or when I clamped the fuel line and removed the clamp after the engine had started.

- **Takeoff and landing**

The Javelin has very good ground-handling characteristics for a tail dragger. During several flights and crosswind takeoffs, its ground tracking was quite positive. On several occasions, because of rough terrain, the airplane became airborne prematurely, and the wings rocked a little, threatening a tip-stall. During climb-out, only a little rudder command is necessary. Raise the nose to 45 degrees, and the plane will climb effortlessly.



I've tested the landing characteristics of this airplane many times in different weather conditions, and in powered and dead-stick configurations. During powered landings, I had to slow the airplane by reducing power and increasing the angle of attack during the base leg and final approach. The airplane should be landed on the "hot" side.

When the airplane was in the dead-stick mode, I found that its slip characteristic was surprisingly good. In fact, twice, when the engine loaded up and quit, I judged my base-leg-to-final too high. I applied a little right rudder and left aileron, and the airplane quickly lost altitude in a very stable manner.

- **High-speed performance**

The Javelin, like all pattern ships, is designed for high-speed flight. It tracks very straight at full throttle. There are no unusual tendencies with any control input at high speeds Good vertical performance can be attributed to a powerful, light Enya .40 sport engine and, equally important, a very lightly built airplane.

- **Low-speed performance**

The Javelin has all the attributes of an airplane that should be able to fly quite slowly, but if you slow it too much, it tends to tip-stall. My review airplane slows, up to a point, and then drops a wing without warning. This is why I haven't been able to perform a good three-point landing. I haven't tried to move the center of gravity forward (which would probably enhance stability at low speeds) because I don't want to affect the plane's good snap-type aerobatics.

- **Aerobatics**

I found the Javelin to be a positive, fast performer. It easily performs large loops with almost no rudder input. Outside loops are just as clean and only require a little more transmitter-stick deflection for a loop of a similar diameter. I tried a few low inverted passes. Owing to the lack of dihedral, the stability of the airplane is almost the same during upright or inverted flight. It took approximately an eighth of down-stick deflection to sustain inverted flight. As I mentioned earlier, the snap performance is very good. A full-deflection snap roll is completed in less than 1 second. When the controls are released, the airplane stops just as quickly. Momentum doesn't appear to carry the maneuver very far.

With the ailerons set to maximum deflection, the fastest roll I was able to achieve was about 300 degrees/second. The airplane rolls well on its axis, and doesn't appear to require differential aileron throw. During a slow (4-second) roll, a little rudder (about one quarter) command is necessary, as is the down command during the inverted portion. Slow rolls were more difficult to perform with the Javelin than with any other pattern ship that I've flown recently. During four-point rolls, approximately three-quarter rudder deflection was necessary during the knife-edge portion.

Nonetheless, rudder is quite effective on the Javelin. I executed a few knife-edge passes and found that it not only sustained level flight, but it also climbed slightly as I applied full rudder deflection. I tried some spins in the standard (upright) and inverted attitudes. In both configurations, the airplane behaved identically except, of course, for the pull out The Javelin will do a one-turn spin in about 3/4 second. I was unable to push the airplane into a full, true, flat spin, but this was probably a good thing.

installed plywood servo tray. (The tray is cut so that you can use a variety of standard servos with it.) To ensure that the pushrod has as much resolution as possible through its range of travel, I used the outermost hole of the largest arms I could fit inside the model. This reduced sensitivity at the control horn.

I secured the aileron servo using a plywood plate that I epoxied flush with a pre-cut rectangular hole in the wing. I used an Enya* .40 sport engine with Morgan's* Cool Power 15-percent-nitro fuel. This engine is light, and I needed almost 14 ounces of nose weight for balance.

The cowling and wheel pants are made of light, vacu-formed, ABS plastic, and I used PVC glue to hold them in place. If you want to use the wheel pants, reinforce them with some plywood for the wood screws that hold the straps on.

"The Javelin is a fast, durable sport/pattern ship. ... it's the type of plane you'll want to take to the field again and again."

The canopy is clear plastic. I cut it out and secured it to the fuselage with small wood screws.

I cut the decals out of a single sheet. First, I cleaned the airplane with alcohol. Then, I sprayed window cleaner on the model and slid the decals on. They looked great, but before I even started the engine, I could see parts of some decals lifting. This was disappointing, because the decals contribute to the aesthetic appeal of the airplane.

SUMMARY

The Javelin is a fast, durable sport/pattern ship. I've enjoyed building and flying the model; it's the type of plane you'll want to take to the field again and again. I'm an old-schooler who likes wooden airplanes, but I don't have the time to build them. The Javelin offers the best of both worlds.

**Here are the addresses of the companies mentioned in this article:*
***Cermark Electronics and Model Supplies Co.**, 107 Edward Ave., Fullerton, CA 92633.*
***Horizon Hobby Distributors**, 3102 Clark Rd., P.O. Box 6029, Champaign,IL 61821.*
***Hobbypoxy Products**; Division of Pettit Paint Co. Inc., 36 Pine St., Rockaway, NJ 07866.*
***JR Remote Control**; distributed by Hobby Dynamics Distributors, 4105 Fieldstone Dr., Champaign, IL 61821.*
***Enya**, P.O. Box 391, Edison, NJ 08818.*
***Morgan Fuels**; a division of Morgan Inc., P.O. Box 1201, Enterprise, AL 36331.* ■

RETRACTS

(Continued from page 83)

worth of nylon landing-gear straps and an hour of labor, the Aerostar RG was ready to go. I hope you'll have as much fun with this retract design as I have!

**Here are the addresses of the companies mentioned in this article:*
Midwest Products Co. Inc., *400 S. Indiana St., Hobart, IN 46342.*
Hobby Lobby International, *5614 Franklin Pike Cir., Brentwood, TN 37027.*
Cannon Radios*, sold by Charlie's R/C Goodies, 2828 Cochran St., Simi Valley, CA 93065.*
Futaba Corp. of America, *4 Studebaker, Irvine, CA 92718.*
Top Flite Models, *2636 S. Wabash Ave., Chicago, IL 60616.* ■

SCALE MASTERS

(Continued from page 71)

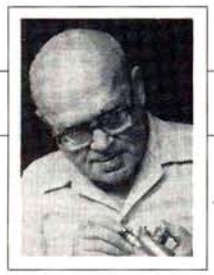
almost unbelievable. He also indicated that he would like to step back and relax—perhaps become an advisor to someone who might be interested in filling his shoes as "head man." Knowing how much energy Lee has put into the program, I expect those shoes might take *a team* to fill!

Back at the field on Sunday morning, the guy to beat was Diego Lopez, who had scored a nearly perfect 96 on his fourth flight. Since the flight scores were determined by averaging the best three flights, Lopez elected to stand on his 90.16 average, which would be tough to beat. Anyone who even thought he was in contention knew he had to complete a flight that was as near to perfect as it could be. Don Hatch flew an 88.25 in his final round to give him an 89 average—not quite enough to catch Lopez. Terry Nitsch posted his best flight of the meet, but it still fell short. After all the smoke had cleared and the last airplane was back on the ground, Lopez had won the 1991 Scale Masters Championships with his beautiful Southeast Asian camouflaged AD-6 Skyraider. The 1.1-point difference between Diego and 2nd-place finisher Hatch may *seem* small, but the same 1.1-point margin separated Bill Carper's 5th- and Patel's 9th-place finishes!

If you didn't make it to this Scale Masters Championships, I hope what you see here conveys some of what went on; if you've *never*

(Continued on page 107)

BUILDING MODEL AIRPLANES

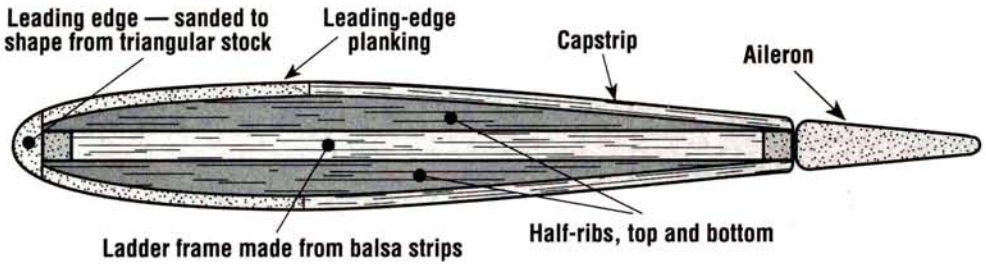


JOE WAGNER

LADDER-FRAME WINGS

CONSTRUCTING accurate, twist-free model wings with symmetrical or semisymmetrical airfoils has always been tricky. Holding fixtures, alignment tabs on the ribs, and blocked-up leading edges are some of the methods currently in use. They may work OK, but they aren't especially convenient.

I've developed a new, easier technique that has several advantages over the other systems. It's particularly useful for model wings of your own design, because it greatly simplifies the rib pattern layout, and it even allows you to build tapered wings with only one or two rib shapes required, instead of a different one for each rib station.



Typical construction of a symmetrical-airfoil wing with ladder-frame core.

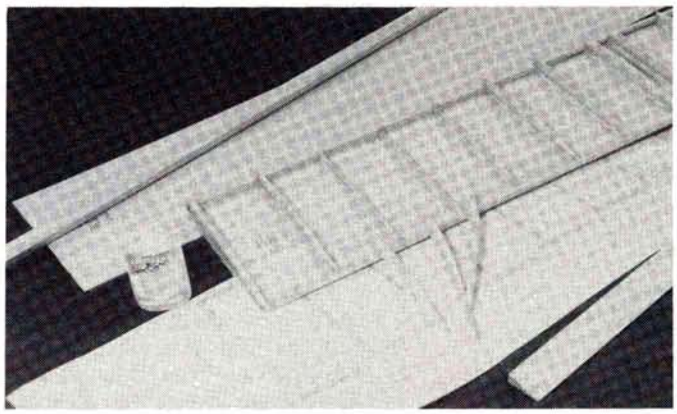
Here's how it works. You begin by assembling a ladder-like frame out of balsa "sticks" that lie flat on your building board. Then you add sheet balsa half-ribs to the "ladder rungs" to complete the top half. After that, you glue on either (A), an overall sheet-balsa skin over the ribs, or (B), a leading-edge sheet plus aft capstrips. Then you remove this structure from the board, turn it over, pin it back onto the flat surface, and repeat the half rib and sheeting procedure. (For a symmetrical, rectangular wing, the half ribs are all the same. A semisymmetrical airfoil, of course, requires a thinner set of half-ribs on the bottom than on the top.)

When both surfaces of your wing are complete, you remove the assembly from the board, and with a long sanding block, carefully true and square the front edge. A length of 45-degree tri-stock balsa goes on next for the leading edge. Standard, tapered, trailing-edge stock can be added to the rear edge for the aft portion of the airfoil or, if you plan to use strip-type ailerons, their hinges can be attached within the ladder frame's back edge.

The only woodwork left to do at this point is to add and shape the block-balsa tips. Complete the job by rounding off the leading edge's corners; then smooth-sand the wing all over. Now it's ready for covering or paint.

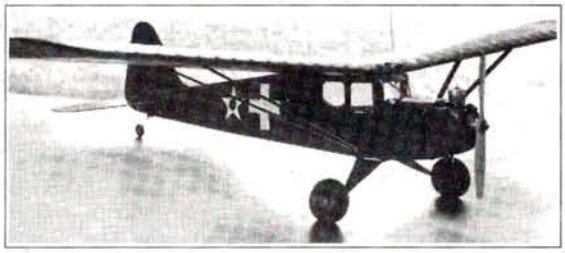
To adapt this method for tapered wings, the only changes required are to glue the half ribs even with the *rear* edge of the frame; trim each one off flush with the *front* edge; then sand the forward portion of the half-ribs with a long, straight, sanding block to provide a smooth, continuous contour all the way from the root to the tip. You can probably do this job accurately enough by "eyeballing." For maximum precision, however, you can make plywood half ribs for the extreme tips, and use those as sanding templates to ensure airfoil accuracy from root to tip.

The procedure just described is for a wing without dihedral. If you want dihedral, adding it is easy enough. Make the "ladder rungs" and ribs extra thick (e.g., 1/2 inch thick) where the dihedral break occurs. When the structure is complete and sanded smooth, carefully saw the wing apart on the center line of the thick rib. Then sand the edges flat and at the proper dihedral angle, as you would an all-balsa glider wing. Butt-join the halves with a non-brittle glue (I like Zap-A-Gap* for this job), and reinforce the joint, top and bottom, with nylon tape.



Halfway along with a fully sheeted symmetrical, ladder-frame wing. CA makes construction fast and minimizes the need for pins.

Wings constructed according to this new method are far lighter than foam wings, yet they're just as strong and warp-proof. You



The addition of wing struts, olive-drab dope and U.S. Army 1941 War Games insignia turned this Ace R/C Air Scout into a semi-scale Taylorcraft Grasshopper.

KIT BASHING

For modelers who don't have time for scratch-building, modifying a kit design provides a great way of personalizing their R/C airplanes. At first glance, it might seem that today's highly prefabricated kits don't offer much scope for creativity, but with imagination and ingenuity, a highly individual-looking aircraft can be constructed from practically any available R/C kit.

I'm not referring here to cosmetic changes, like custom trim schemes or cowls and wheel pants, but to reshaping the model to resemble a particular full-scale airplane. Wingtips and tail-surface planforms can easily be modified.

Fuselages present a little more difficulty, but adding soft balsa or foam fairings to alter the outlines is relatively easy and doesn't increase weight significantly. Changing from a tricycle to a tail-dragger configuration provides another customizing option.

Here are a few ideas to stimulate your thinking: Sig's Kadet Mk 2 can be made into an RAF Auster AOP 9 look-alike; its Four-Star 40 could be "doctored" into a Zlin 50L. I've reworked an Ace R/C Air Scout into a 1941 Taylorcraft Grasshopper and an Ace 1/2A Pacer into a Northrop Gamma. None of these are true scale projects, of course, but they definitely give that impression!

Even the boxy, slab-winged trainer kit can be altered without great effort into a Pilatus TurboPorter or one of the 1930-vintage Curtiss or Fairchild cabin monoplanes. With a little more work, you could convert one into a Ford Tri-Motor (with dummy engines in the nacelles).

Kit-bashing can be a lot of fun. Once you get started, more ideas will pop into your head every time you see an R/C kit: "Hey, this Ugly Stik wouldn't be too hard to make into a Heinkel He5 seaplane, and that Sig Kiwi has a sort of Ryan ST-like shape... ."

Without great effort, this all-foam Goliath King Condor could be converted into a stand-off-scale Lockheed U-2.

Give your creative impulses a chance to develop by modifying stock kits. That's the first big step toward designing your very own R/C models!

can even use this technique to construct wing panels with deliberate warping, such as those for flying wings, where built-in washout is required.

**Here's the address of the company mentioned in this article:*
Zap-A-Gap; *distributed by Frank Tiano Enterprises, 15300 Estancia Ln., W. Palm Beach, FL 33414.* ■

SCALE MASTERS

(Continued from page 94)

attended a scale competition like this, try to do so. What you'll see will impress, if not amaze, you. Better yet, participate. Check the contest calendars for the qualifier in your area, get your scale model out and enter. Who knows? After the next competition, we may be talking about *you* right here! The 1992 site won't give you the chance to lose all your money at the tables, but while you're there, you can enjoy the finest beefsteak in the world. See you in Dallas! ■

GOLDEN AGE

(Continued from page 76)

The Logictrol catalogue offered a wide variety of systems, from the Ranger to the exotic. They were available in the "LRB" style, or with separate components as was industry standard. The middle to top-of-the-line systems included many technical features that are considered exemplary today: a transmitter with PPM modulation, (automatic gain control) AGC and a buddy-box provision—available in all control modes, including single stick; a dual-conversion receiver that included AGC and could operate down to 3.3 volts (known as "one-cell-out capability").

It's fairly obvious that, technically, these early Logictrol systems are a good match for our modern radios (with the possible exception of some of the super systems recently marketed). Value-wise there's little comparison; like all early propo systems, Logictrol cost in the $400 to $500 range. On checking with former Logictrol owners, I found that, like the owners of Pro-Line products, they reported long-time trouble-free operation.

The catalogue doesn't show the system with which I had considerable experience. E-K offered a system that was comparable to the Pro-Line one and could be ordered specially—the Championship Model. What impressed me

(Continued on page 108)

GOLDEN AGE

(Continued from page 107)

was the unusually small, light airborne equipment—only about three-quarters the size of what was usual. Quality was apparent also, and I was curious enough about it to order one. The system proved to be all they claimed it to be, and it served me flawlessly for many years.

Others tell us that the LRB-4 system was very popular with the soaring fraternity. Very compact and light, with two channels in the brick, it was most convenient for glider use.

It also seems that E-K offered the largest selection of accessories for use with Logictrol. There was a multitude of servo-mounting trays—one to fit every possible need: dual-control mixers, control hinges, glider tow hooks. You name it; almost anything could be injection-molded to suit your fancy.

What happened to E-K? Jerry Krause left several years before the end, and Bob Elliott's attention went elesewhere. The probable cause of E-K's demise was the Japanese invasion; its Mexican connection wasn't enough to overcome *that*. Of course, Bob Elliott is the only one who knows the complete answer.

Again, please remember this is your OT R/C place. Your input is vital. ■

AIRWAVES

(Continued from page 10)

NEXT UNLIMITEDS

You have a great magazine. The Madera Unlimited Races are of great interest to me, and I enjoyed your coverage. I say congratulations to the winning Hemple A-26 team. People stuffed a 21-pound drone engine into a P-51! Anyway, I recommend that they keep the rules unlimited and just give a bunch of trophies. For example, trophies could be awarded to the fastest single-engine 2-stroke, the fastest single 4-stroke, the fastest twin 2-stroke, the fastest twin 4-stroke and the fastest per-pound total weight. The best money should go to the overall fastest entry, with good, worthwhile cash prizes and prestige to all the top finalists.

TOM FEY
Arlington Heights, IL

Tom, the decision on which rules will be applied at future Unlimited Races is still being resolved. Two groups are taking the initiative to continue this pre-eminent R/C contest, and each group is considering different rules. One group is called "The Unlimited" and is planning to hold a race some time in late September. They plan to abide by the fairly unrestricted rules that applied to the '91 Madera races. For details, call Lesley Burnett: (310)

(Continued on page 109)

AIRWAVES

320-8369. The "R/C Unlimited Racing Association, Inc." is planning an Unlimited race for April '92 in Arizona. It will apparently be a "shakedown" race that will allow the participation of those who qualified at Madera. But this second group is considering rules that go beyond those applicable to the Madera races. They include an increase in minimum wingspan on selected twins (e.g., P-38 Lightning—112 inches; F7F Tigercat—112 inches; A-26 Invader—122 inches). For information, call Dave Johnson: (602) 722-0607. We look forward to having a unified set of rules (agreed to by all participating organizations) that will promote Unlimited racing nationwide. TA

TWIN QUESTIONS

I'm a scratch-builder, and I've built and flown several aircraft successfully. Now, I'd like to build my first twin-engine airplane, and I have some questions I hope you can answer.

1. How are engines modified to run backwards (as with counter-rotating props)? Will this modification work with any displacement—2- or 4-stroke?

2. Is it acceptable to use different manufacturers' engines (with the same displacement, of course) on a twin-engine aircraft? Would subtle engine performance aspects of two different engine brands (without a synchronizer) be a problem?

3. Are both engines of a twin usually controlled by a single servo, or is it best to have each engine throttled separately?

4. Do twins usually have a few degrees of outboard engine thrust for yaw stability?

The recent and continuing explosion of ARFs disturbs me. I believe that the essence of modeling is scratch-building, whether from purchased plans or drawn-and-designed-yourself plans. This attitude may seem like that of an old-timer, but I'm only 25 years old, and I've been involved with this hobby/sport for only three years. More people should experi-

(Continued on page 110)

AIRWAVES

(Continued from page 109)

ence the satisfaction of building from scratch. It's not as difficult as many seem to think!

JEFF SORG
Rosamond, CA

Jeff, I hope this helps:

1. With the 2-stroke, some manufacturers offer a reverse crankshaft that has reverse port timing. Before you decide on an engine brand, check whether this part is available. With 4-stroke engines, it's a different story. With some, i.e., the Abitar and the English Magnum, it's a simple matter of swapping the carburetor and the exhaust stack; with others, like the Enya, it's a matter of re-timing the cam gears. With Saitos, you'll need a reverse camshaft, since both cam lobes run off a common gear. Again, check with the manufacturer.

2. This is unacceptable. All engines have unique handling characteristics, especially when it comes to throttle response. Why exacerbate an already challenging situation? Hold as many variables constant as you can. For example, you should use identical engines with identical ages.

3. Yes. Twin engines are most often controlled by one servo (or two servos running off the same channel with a Y-cord). Extensive

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AIRWAVES

(Continued from page 110)

tuning and linkage tweaking is performed on the ground. Engine synchronization is done with a tachometer and, unless you have a remote rpm read-out on your transmitter (and I doubt you do), separate throttles for in-flight tuning aren't possible.

4. Yes, this is often incorporated into a twin design. On some kits, i.e., the Royal B-25, slight inboard offset is built into the vertical fins.

The essence of modeling is found in the enjoyment. If flying ARFs brings an individual pleasure, he shouldn't be told by anyone that he isn't enjoying the hobby in the "correct" fashion. I don't understand why you're disturbed; all modelers, including you, should find enjoyment in any way they see fit, as long as it infringes on no one. CC

GREETINGS FROM ESTONIA

The independent Aeromodeling Club of Tartu is quite a young club, but its members have been involved in aeromodeling for many years. The main field of the R/C section of our club is F3B and lately, we've started with 2-

(Continued on page 126)

SPORTY SCALE TECHNIQUES

FRANK TIANO

TOP GUN PRODUCTS AND INSURANCE

If you thought our Swiss friend, Franz Patton, did a good job on "Rare Bear" a while back, get a load of his 80-inch "Red Baron." Every one of those markings was done by hand. The stencils were fabricated from beer advertisements.

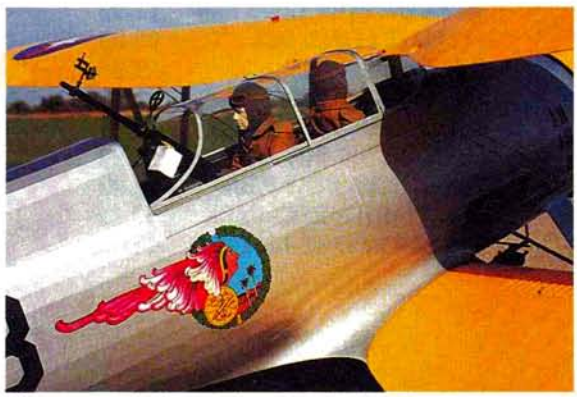
WOW! THERE'S so much really neat stuff to talk about this month that I just don't know where to begin. For sure, though, I'll share some dynamite airplanes with you. Before I start, may I just say that I truly appreciate it when you send crisp, clean photos of your new projects, or those of your friends. I'd also like to say that, since I mentioned that I prefer photos that don't feature the airplane sitting in knee-high reeds, you've really come through. So, I guess it's time to let you in on another secret that will keep the editor and the publisher smiling. It's a variation on the old keep-the-ballpoint-pen-ink-marks-off-the-front-of-the-photo trick. If you write on the back of your photos and then stack them together to mail them, the ink is transferred from the back of the photos to the front of those underneath, and that renders them just about useless. If you'd like to tag your pictures, use removable stick-on notes and a felt-tip pen. Stick the notes on the front of your pictures, and go ahead and stack them. They'll be perfectly safe and very useable. Well, enough of this stuff; let's get going.

ABOUT TIME

There are several new products that I'd like to share with you. First, there's an absolutely beautiful set of drop tanks and some other miscellaneous stores that are ready to be fitted to your F-16 Falcon. Although these units are offered by Bob Violett Models* (BVM) for its F-16, they'll also enhance the looks of your Byron or Yellow F-16. And we all know that a bare F-16 is about as attractive as a pair of dirty feet. Garland Hamilton did all the research and plug work for BVM, and he reports that the bird flies as well loaded for bear as it does empty. In fact, the boys in California tell me that ol' Garland did a 300-foot-diameter loop the very first time he flew the plane with all this stuff hanging on it. Call BVM for prices.

Red Baron Pizza sponsors an air-show team of five beautiful Stearmans. Jim Sandquist sent us a picture of his. It was built from a Dively kit and is powered by an A7M 4.2 Sachs Dolmar. The 45-pound ship is fully aerobatic, and it uses our dummy engine to full advantage.

There's also some really nice stuff available from Bill Raub's new company, Cirrus Ventures*. Although this company is certainly in the growing stages, the hardware it offers is way overdue and will be a welcome addition to any scale modeler's workshop. Bill has a line of metal, absolutely no-slop, bellcranks as well as beautiful tailwheel assemblies, very special motor mounts that do a terrific job of isolating vibration, and



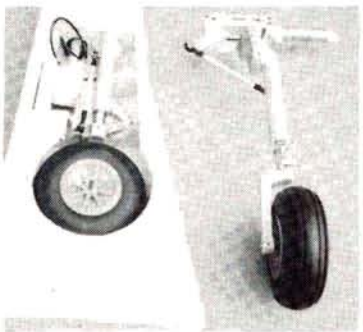
What a great-looking airplane! Claude McCullough's Waco with Cuban Air Force markings is truly a work of art. The paint job and covering can only be considered flawless. Full-blown competition?—you betcha! Take a gander at this artwork along the side of the Big Waco. Yes, there are a few good craftsman left.

Tom Street's team-scale, Top Gun entry is about as close to the real thing as you can get, if you get our drift!

Garland Hamilton's award-winning Bob Violett "Bagdad Express" F-16 is a thing of sheer beauty with all that garbage hanging off it. These tanks and ordnance are additions that make a fighter look as if it means business instead of looking like a wimp. Yes, those are real F-18s in the background

a whole series of pulleys and cable-drive systems for larger, scale or ducted-fan use. All of this is manufactured in Australia by Scale Aviation. I promise that if you appreciate state-of-the-art linkages and enjoy a slop-free society when it comes to surface control, you'll find Cirrus Ventures' $2 catalogue very worthwhile. Chalk another one up for safety and longevity!

This column just wouldn't be doing its job if I didn't mention the new plans or plan/packs available from our old friend Bob Holman*. Right now, Bob is offering a new 70-inch plan of the very successful Brian Taylor Hurricane and a good blow-up plan of Taylor's P-51 Mustang. By the time you read this, a fiberglass fuselage kit of Doss Steed's 92-inch Mustang should be available, too. Bob's very informative scale-plans catalogue costs $6, and it includes a comprehensive list of three-view drawings. For an extra $9, you can order Bob's brand-new German catalogue. It features lots and lots of foreign plans and possibly the best selection of WW I aircraft plans you've ever seen! I know that Ralph Jackson has been flying an 80-inch "Holman" Fokker DVII for quite some time now. In fact, he even sport-flies it at his club field when there aren't any contests in the area.



This is the long-awaited Grumman Bearcat scale landing gear. Available from F.T.E., the gear shortens as it retracts. The prototype worked well on only 25 pounds of air pressure!

Last, but not least, I'd like to give Frank Tiano Enterprises* a small plug! (I think I can do this because there's really no competition for the product I'm selling.) A few issues ago, I mentioned that Jerry Bates had just released a gorgeous 80-inch Grumman Bearcat, and that I'd try to offer a set of those very difficult-to-manufacture, articulating/shrinking, retractable, scale landing gear and struts for this magnificent aircraft. Well, the prototype has been completed and tested. I have a limited production run of these gears, and they sell for $450 a set (plus $8 for UPS charges), including the main gear and struts. (The support equipment, i.e., air lines, filler valves and switcher valves, aren't included.)

TOP GUN UPDATE

Here's the latest poop on Top Gun. Once again, the event will be co-sponsored by *Model Airplane News* and Pacer Technology. (See the ad on page 79 of the January '92 issue.) If you need assistance with travel arrangements, call Cindy Burkey of Southport Travel at (800) 735-0401, and ask her about the discounted fares on American Airlines. She can also give you information on rental cars or alternate ho-

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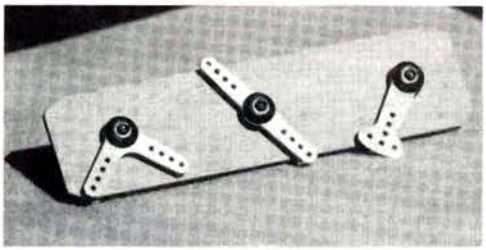
tels. Those who don't wish to stay at the Polo Club can stay at the Palm Beach Sheraton Hotel for less than $50 each night, which includes a free breakfast and a newspaper! And it's less than 25 minutes from the Top Gun flying field. To get the special rates at the Polo Club, you must make at least a four-day reservation. Last year, people couldn't book rooms at the Polo Club for the entire tournament because so many rooms were used by people who stayed there only on Saturday evening.



Cirrus Ventures has stuff we need. No-slop bellcranks have eluded us for years. They're here now, though, along with all sorts of neat control-surface pushrods and cable systems. Manufactured in Australia.

It turns out that all, and I do mean *all*, of the scuttlebutt about a frequency conflict at the Top Gun flying site was absolute nonsense! Our self-proclaimed expert's opinion that there was a conflict from the channel 4 or 5 television station was nothing but baloney. The rumor that area paging systems were splashing all over our frequencies was also incorrect. It cost Top Gun slightly less than $1,000 to find this out. We took Tony Stillman and some very expensive, very sophisticated equipment from Radio South to the Polo Field for many hours of scanning and testing the airwaves. I don't wish to bore you with the entire report, but let's just say that any pager activity was exactly where it should have been—on low output, and *not* on our channels—and there wasn't any activity from the television stations either.

Here's some more good news. Since AMA President Don Lowe decided to cancel the AMA's sanction of Top Gun for future years because of the proximity of the empty houses at the far side of the field, we almost had a problem. I said "almost." Thank goodness that the Polo Club already carries five times the insurance that we get from the AMA and has willingly put Top Gun on its schedule of events. Of course, just like the AMA, anyone involved in an altercation will still have to go through his homeowner's policy first and then turn to the site insurance. There's still more good news. Doug Pratt told me about a group of insurance people who are modelers, too, and they have formed a brand-new organization that will offer insurance to anyone, at any time, at any place, member to member, member to family, member to non-member and about any other bizaare combination you may come up with, as long as you're following the safety rules. I'm so thrilled with the new Sport Flyers Association (SFA) that I urge all of you to spend the $25 it takes for full coverage and join the rest of us. All I heard about the SFA at the recent Gathering of Eagles was, "It's about time!" For fast, courteous information, you can call them at (800) 745-3597.

Just to prove he still has what it takes, Top Gun's chief flying judge, George Leu, gives us a peek at his new T-38 from Custom R/C Aircraft. It uses a single Dynamax fan and an O.S. 91 for power.

The general schedule of events for Top Gun is about the same as last year. Static Judging will commence on Thursday morning, May 7, and continue through Friday afternoon. There will be plenty of time to catch the practice flying on Wednesday through Friday, and we have

some wonderful demonstrations on all four days of competition. We'll fly four rounds of competition on Saturday and Sunday. There will be four rounds of Top Gun Helicopter competition flown as well—probably between the rounds of the fixed-wing aircraft. There will be a cocktail party on Thursday evening, and everyone is invited to attend. On Friday evening, there's another cocktail party and buffet, but this one is for pilots, crew, press and anyone who has purchased a ticket for Saturday night's annual Top Gun Dinner Dance. Awards are usually completed by 4 p.m. on Sunday.

We had a terrible setback last year when I lost my dear friend, and Top Gun's Chief Judge, Fran Olix, to cancer. In our effort to make TG even better for the contestants, we've adopted Fran's idea of having a chief static judge and a chief flying judge. Tim Farrell and George Leu will carry out these duties respectively.

For those who are interested, the very special class set up at Top Gun for manufacturers was a complete bust. Only one inquiry came through, and that was from Australia! So, for the guys who have been overly concerned that the glory and trophies are going to be "bought" by those with the most money, it's nonsense. As we suspected, competition remains for that small percentage of modelers who really enjoy it.

Well, that's about it for another month. We have some really interesting pictures from our readers for you to look at, and I'll return next month with a report on the Gathering of Eagles. You'll love it! Until then, remember to keep the lion away from the leopard; you can't get nitro by reducing your dentist's laughing gas; and keep checkin' that six!

**Here are the addresses of the companies mentioned in this article:*
***Bob Violett Models,** 1373 Citrus Rd., Winter Springs, FL 32708; (800) 899-1144.*
***Cirrus Ventures,** 115 Hunter Ave., Fanwood, NJ 07023; (908) 322-7221.*
***Bob Holman Plans,** P.O. Box 741, San Bernardino, CA 92402.*
***Frank Tiano Enterprises,** 15300 Estancia Ln., W. Palm Beach, FL 33414.* ■

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Non-commercial Rate: 15 words or less, $4.50; additional words, 25¢ each. No charge for name and address. (No commercial ads of any kind accepted at this rate.) Commercial Rate: 50¢ per word (applies to retailers, manufacturers, etc.); count all initials, numbers, name and address, city, state, zip code and phone number. All ads must be paid for in advance. To run your ad for more than one month, multiply your payment by the number of months it is to run. Deadline: the 10th of the third preceding month (e.g., January 10 for the April issue). We don't furnish box numbers, and it isn't our policy to send tear sheets.

SEND AD AND PAYMENT TO: CLASSIFIED ADS, MAN, 251 Danbury Rd., Wilton, CT 06897 ATTN: Laura Kidder.

BERKELEY, CLEVELAND, ETC., replica kits, duration rockets for jet models. Send three stamps to: WILLAIRCO, 2711 Piedmont Rd. NE, Atlanta, GA 30305.

WANTED: Model engines and race cars before 1950. Don Blackburn, P.O. Box 15143, Amarillo, TX 79105, (806) 622-1657.

1930s to 1950s MODEL AIRPLANE MAGAZINES; 1930s aviation pulps, complete and good condition; $1 for list. Bruce Thompson, 328 St. Germain Ave., Toronto, Ontario, Canada M5M 1W3.

START YOUR OWN HOBBY SHOP or buy for friends or group; 30 to 60 percent off. For information, send $1 and no. 10 SASE: R&L HOBBIES, 10334 Portage Rd., Box MAN, Portage, MI 49002.

WANTED: kits from 1950s and '60s, especially: Monogram, Berkeley, Speedee-Bilt, Babcock, Veco, Scientific U/C, deBolt, Top Flite, Taurus and Tauri. Dr. Frank Iacobellis, 15 Highland Park Pl., Rye, NY 10580; (914) 967-5550.

HELICOPTER SCHOOL—5 days of hands-on instruction with X-Cell helicopters and Futaba computer radios. Small classes tailored to your individual needs. Beginner to expert. Includes all meals and lodging. Over 160 satisfied students and 5,600 flights logged. Located on a 67-acre airport used exclusively for R/C training; owned and operated by Ernie Huber, five-time National Helicopter Champion and helicopter designer. Send for *free* information and class schedule *now!* R/C FLIGHT TRAINING CENTER, P.O. Box 727, Crescent City, FL 32112-727, or call (904) 698-4275 or Fax (904) 698-4724.

GIANT SCALE PLANS by Hostetler. Send SASE to Wendell Hostetler's Plans, 1041 B Heatherwood, Orrville, OH 44667.

R/C WORLD—ORLANDO, FL, CONDO RENTAL—2 bedroom, furnished. Available weekly or monthly. Low rates, 100 acre flying field with enclosed hangar. Swimming pool, tennis courts on site. Minutes from Disney World and Epcot Center. For information, call Michelle, (800) 243-6685, or write to Air Age, Inc., Condo Dept., 251 Danbury Rd., Wilton, CT 06897.

WANTED: Model airplane engines and model race cars made before 1950. Jim Clem, 1201 E. 10, P.O. Box 524, Sand Springs, OK 74063; (918) 245-3649.

WANTED: Berkeley and Cleveland kits or related items: parts, plans, boxes, brochures, books, ads, radio equipment, accessories, etc. Gordon Blume, 4649-191st Ave. S.E., Issaquah, WA 98027.

ANTIQUE IGNITION AND GLOW PARTS CATALOGUE: 100 pgs., timers, needle valves, original cylinder heads, point sets, drive washers, stacks, spark plugs, plans. Engines: Atwoods, Baby Cyclones, McCoys, Hornets, others. $8 postpaid U.S., Foreign $20. Chris Rossbach, R.D. 1 Queensboro Manor, Box 390, Gloversville, NY 12078.

SCALE MODEL RESEARCH Aircraft Documentation. World's largest. Over 3,000 different Foto-Paaks and 10,000+ drawings. Catalogue $4. 2334 Ticonderoga, Costa Mesa, CA 92626 (714) 979-8058.

INTERNATIONAL AIRCRAFT RESEARCH—Need documentation? Include name of aircraft for availability of documentation with $3 for 3-view and photo catalogue. 1447 Helm Crt., Mississauga, Ontario, Canada L5J 3G3.

OLD-TIMERS, take a ride back in time to airplane modeling roots with this vintage book—*Gas Models*. A true collector's book from the early editors of *Model Airplane News*, it contains the best of modeling from the '30s and '40s, including great technical information and classic construction articles from the Golden Age period. $7.95, add $2.95 S&H for first item; $1 for each additional item. *Foreign:* (including Canada and Mexico)—*surface mail*, add $4 for first item, $2 for each additional item; *airmail*, add $7 for first item, $2.50 for each additional item. Payment must be in U.S. funds drawn on a U.S. bank, or by international money order. Connecticut residents add 8% tax. Air Age Mail-Order Service, 251 Danbury Rd., Wilton, CT 06897.

WANTED: Old unbuilt plastic model kits. Planes, military, figures, cars, promos. Aircraft or missile desk models. Send list, price. Models, Box 863, Wyandotte, MI 48192.

R/C HELICOPTER TRADER. Published every other week. Helicopters, parts and accessories. For free copy, send SASE to P.O. Box 702, Arlington, TX 76004.

ENGINES: IGNITION, GLOW, DIESEL—new, used, collectors, runners. Sell, trade, buy. Send $2 for large list to Rob Eierman, 504 Las Posas, Ridgecrest, CA 93555. (619) 375-5537.

PLANS ENLARGED—dot-matrix plotting software; scanning/plotting CAD. Free information. Concept, P.O. Box 669E, Poway, CA 92074-0669; (619) 486-2464.

BALL BEARINGS—chrome steel; in stock to fit most model engines; metric or standard; Fox, K&B, O.S., OPS, Webra, YS. SASE: REVMOR, P.O. Box 548, Palm City, FL 33490; (407) 283-6831, after 5 p.m.

COMPUTERIZED AIRCRAFT PLOTS: Technical illustrations suitable for framing. Three-views. Computer scale drafting and scanning services. Turn old prints into masterpieces! Catalogue, $1. D-TECH SYSTEMS, Rte. 2, Box 191-14, Carterville, IL 62918.

WANTED: I will buy your old, outdated R/C systems. Ron Gwara, 21 Circle Dr., Waverly, NY 14892. Tel.: (607) 565-7486.

R/C HOBBY SHOP/GAME ROOM—health forces sale. Asking $73,000, which is in inventory and fixtures. Jasper, TN (615) 942-4035/942-3703.

P-38! COLUMBIA MODEL WORKS is offering kits, plans and accessories for its giant-scale P-38. Scale: 95 inches; sport scale: 105 inches. For info pack send $1 to: Columbia Model Works, 3411 Sherwood Dr., Columbia, MO 65202; or call (314) 474-3285.

WILL BUILD ready-to-fly or display plastics to giant R/C helis, tanks, etc. Scratch-built or kits. Professional repairs. Modelworks, Box 482, Saguache, CO 81149.

WHAT A BARGAIN!—found in heated warehouse: 84 brand-new, all-balsa "Cutlass Supreme Mk II deluxe kits designed by Don Lowe and produced by Mini-Flite Co. of NJ in 1973. The 64-inch tapered-span kits are complete with die-cut balsa, spruce spars, full hardware packages, etc., and full-size plans with details for optional retracts. The balsa alone is worth the price! *Once in a lifetime buy* at $59 each plus $15 shipping. First come basis. *Special for clubs or groups:* four kits shipped in one carton for $215 PP in the U.S. Money order or bank check or, to order picture and specs, an SAE to: Fred Angel, 33 Boston Tpk., Shrewsbury, MA 01545; (508) 754-4197.

GIANT-SCALE PLANS—send SAE to Dry Ridge Models, 59 McCurry Rd., Weaverville, NC 28787.

CAPS, PATCHES, JACKETS all types of custom embroidery; 3-inch patches, 150 pieces at $3.25 each. Embroidered caps from $5 to $15. More than 3,000 stock logos. Embroidered jackets, $70 and under. Contact Creative Sportswear, P.O. Box 158, Oley, PA 19547; (800)

NEW (4-INCH) HORNER twin; silent-spark ignition, coupled timing, plugs; test run. $439.95 including P&H. Limited quantity. Al Diem, (801) 298-7254

X-CELL HELIS: I have three X-Cell .60s and a Concept 30SX for sale. Also, JR x347, five Futaba S9302 servos, O.S. .60 Heli (NIB) modified by Power Concepts, jig-saw blades and much more! Leaving hobby.... First $3,000 takes all. Mark, (904) 760-8220; P.O. Box 291164, Port Orange, FL 32129.

VACUUM-FORMING—do it yourself. New, 128-page, illustrated book shows you how. Make car bodies, helicopter canopies, airplane parts and boat hulls. Start with ultra-low-cost basic setup, or form up to 1/8-inch-thick plastics with innovative, two-stage vacuum system. Make a high-vacuum source for less than $6. Eight chapters include plastics, molds, heat & vacuum sources, tips and examples. It's easy! Try it! $9.95 (plus $1.05 postage), Vacuum Form, 272B Morganhill Dr., Lake Orion, MI 48360.

IMPORTED DIESEL ENGINES—AE, Aurora, Cipolla, D-C, KMD, MAP3, MIKRO, MK, MVVS, PAW, Pfeffer, Silver Swallow and USE. Also replica Letmo, Mills and MOVO diesels and rare imported glow engines and CO_2 motors. Ten-page catalogue, $1. CARLSON ENGINE IMPORTS, 814 E. Marconi, Phoenix, AZ 85022.

FLYING, PRE-COLORED PAPER PLANES: Spitfire and ME 109 (5-inch wingspans) with illustrated "Battle of Britain" history booklet; $5. SHOWCASE AVIATION, 2507 Emerson Dr., Midland, TX 79705.

PIPE AND CASE REPAIR—$12.50. Stud removal, broken pipes and mufflers, holes, cracks, chips and "dog-eared" cases. Mutilations evaluated. Send to: Alloy Tactics, P.O. Box 1151, Lithonia, GA 30058; phone: (404) 972-1741.

WANTED: Pitcairn PCA-2 autogyro or similar looking design. Would like 60-size model plans. Marvin Leazenby, 3105 Moore Rd., Anderson, IN 46011.

GEE BEE R-2, Hall "Bulldog," Monocoupe plans used by full-scale replica builders. Extensive catalogue, $3 (refundable). Vern Clements, 308 Palo Alto, Caldwell, ID 83605.

MODEL ROCKET with onboard 8mm movie camera! Plans, $11.95. Reeve Publications, P.O. Box 65752, Salt Lake City, UT 84165-0752.

FOAM WING CORES, floats, EPS blocks. All foam cut on Tekoa feather-cut system. Will cut to your specifications. Call or send to: SKY BLAZER PRODUCTS, 448 Vienna St., Newark, NY 14513; (315) 331-7464.

START YOUR OWN BUSINESS! Respected kit manufacturer selling the rights and necessary tooling to produce entire line of scale and sport aircraft. Four kits total, including all current inventory. Priced to sell. Serious inquiries only; (216) 953-1188.

BUTTON-HEAD SHEET-METAL SCREWS—no. 2x1/2, $4.90 for 100; 4-40x3/4 alloy socket caps, $4.75 for 100. New, lower prices on metric socket caps. *Free catalogue*—contact Micro Fasteners, 110 Hillcrest Rd., Flemington, NJ 08822; (908) 806-4050; Fax (908) 788-2607.

CLUB OF THE MONTH

WESTSIDE R/C CLUB
433 N.W. 20th Oklahoma City, OK 73107

There's no doubt about it: the Westside R/C Club takes racing and having fun seriously. In the January issue of the "Westside R/C Flyer," rules are published for monthly races that will be held from April through October. Races are open to non members, but planes must have a minimum of 500 squares, four channels and a working rudder. The engine must be the Fox C-Frame .40 (no tuned pipes), props are your choice, and the nitro maximum is 15 percent. (If you're interested, contact Gayle McGee at the address shown above.) At the January meeting, Norm Johnson (the 1991 Formula 1 national champion) was scheduled to talk about racing, using Formula 1 racers as exhibits.

The club's seasonal plans are a model of how to have fun. Plans include several float flys, fun flys for all skill levels and even a cross-country event for 1992. During the summer months, on Sunday mornings, Don McNeill's Tartan-powered "Big Moose" will be in service to tow gliders. There's more: the club plans several cookouts, and it's considering a midnight fly using chemical light sticks.

President Darrell Idleman sums up this club's attitude: "We'll try almost anything once if it's moral, legal and cheap." We applaud a club as active as the Westside R/C Club, and we're sending them two, one-year subscriptions to *Model Airplane News*. ■

HOBBY SHOP DIRECTORY

Retailers: Make your business grow with new traffic! Now you can advertise your hobby shop in the ***Model Airplane News*** **Hobby Shop Directory**. The listing will be published monthly and will be listed according to city and state. You will have 3 to 4 lines, approximately 20 words, in which to deliver your sales message, plus space for your store's name, address and telephone number.

HOBBY SHOPS: Act now and get the first ad free! Directory space is sold on a yearly basis with a choice of three payment plans: 1. $179 per year, payable in advance; 2. $97 for six months, payable in advance; or 3. $17.50 per month to be billed monthly. Space reservations must be received by the 10th of the third month preceding publication (for example, January 10th for the April issue).

CALIFORNIA—Torrance/Gardenia
Your one-stop R/C shop. We try to carry it all. Major items discounted. Help and advice free. Building and bull sessions allowed on premises. Near LAX.
Owner: John Eaton.
MODEL CENTER
2304 Redondo Beach Blvd. **(213) 327-3862**

FLORIDA—Winter Springs
- UPS orders shipped daily
- Dealer for Yellow Aircraft
- Send $3 for Yellow info pack
- Full line of hobby accessories
- Visit our showroom (35 min. from Disney World)

BOB FIORENZE HOBBY CENTER, INC.
420 W. S.R. 434 **(407) 327-6353**

ILLINOIS—Chicago
Chicago's largest hobby shop. R/C planes, helicopters, boats and cars. R/C repairs, installations and custom building. Mon.-Fri. 10-9; Sat. 10-6; Sun. 11-4.
STANTON HOBBY SHOP, INC.
4734 Milwaukee Ave. **(312) 283-6446**

LATIN AMERICA
COSTA RICA—San Jose
Complete line of R/C airplanes, cars, boats, and helicopters. Parts and professional expert service and advice. Julio Pastura, President. Weekdays 4-10 p.m.
EL HOBBY SHOP
Centro Commercial, San Jose 2000
Apartado 529, Centro Colon **32-26-81**

NEW JERSEY—New Brunswick
R/C helicopters: Concept, Schluter, Parts & Accessories
R/C cars, coats, parts & accessories
Customer Support Available
"A Daddy's Toy Store"
HOVER CENTER PLUS, INC.
131 French St. **(908) 937-5828**

NEW YORK—Brooklyn
R/C planes, helicopters, boats and cars.
Huge discounts on all R/C equipment.
Futaba radios at incredible savings!
Special discount for club members!
This is the place!
Open: Mon.-Sat. 10:30-9; Sun. 11-6
HOBBY KING
2720 Avenue U **(718) 648-5399**

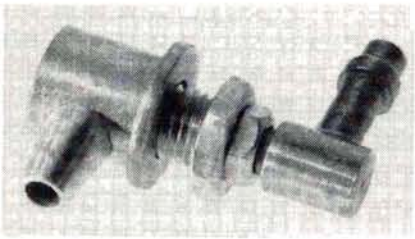
OHIO—Findlay
Findlay's local R/C dealer, planes—cars—boats. We specialize in R/C, large selection of kits, accessories and parts. We're authorized Sig and Dremel dealers. We also sell model rockets.
Tue. & Thu. 1-9;
Mon., Wed., Fri., & Sat. 10-9.
JINX MODEL SUPPLIES
721 Rockwell Ave. **(419) 422-5589**

OKLAHOMA—Tulsa
R/C Specialists, planes, helicopters, cars and boats. We also have kites, boomerangs and plastics. Experienced personnel to answer all your questions. AE, Visa, MC.
Hours: Mon.-Sat. 9-7, Thurs.,Till 8.
WINGS 'N THINGS HOBBY SUPPLY, INC.
5241 S. Peoria Ave. **(918) 745-0034**

NEW YORK—PENFIELD
Full-service hobby shop
27 years of R/C experience!
Airplanes, boats, rockets, pine cars, plastic and wooden models, tools, accessories.
Daily UPS shipping worldwide—special orders encouraged!
Dealer for Ace, Hi-Tec, JR—sales and service.
PANCO HOBBIES
1865 Penfield Rd. (Rt. 441) **(716) 383-1320**

Send sales message and payment to
Model Airplane News **Hobby Shop Directory,** 251 Danbury Rd., Wilton, CT 06897.
For more details or information on our special introductory offer, call toll-free (800) 243-6685 and ask for Laura Kidder.

PRODUCT NEWS

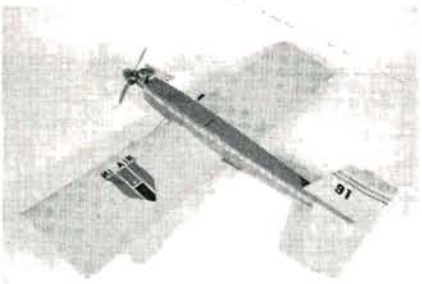


JET MODEL PRODUCTS
Pressure Vent

Jet Model Product's new Pressure Vent supplies pressure to the fuel system by using air speed from the ducted-fan rotor blade instead of using tuned-pipe pressure. The advantages are a more linear rise in pressure and the venting of fuel into the airflow instead of into the tuned pipe.

Price: $14.95

For more information, contact Jet Model Products, 211 N. Mullen Rd., Belton, MO 64012; (816) 331-0356; Fax (816) 331-3930.

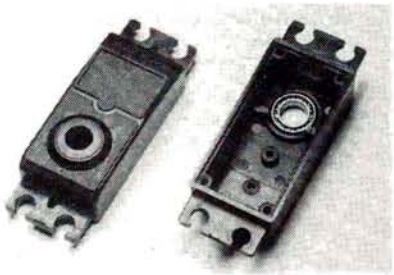


M.I. AIR
Miss Poly

Constructed of 5/32-inch-thick corrugated polypropylene, Miss Poly is easy to assemble (three to four hours) and has Styrofoam wing-cores, a plywood engine mount and an inner structure that's reinforced with hardwood. It can be repaired quickly and is available in a combination of red, yellow, blue and white (your choice); add details using a trim sheet or paint. It's a tail dragger, but it can easily be converted to use tricycle gear. Specifications: wingspan—62 inches; length—48 inches; wing area—867 square inches; weight—7 1/4 to 7 3/4 pounds.

Price: $119.95 (limited-time offer: $89.95) plus S&H.

For more information, send an SASE to M.I. Air, 3111 S. Valley View Blvd., Las Vegas, NV 89102; 1-800-657-4056. To order, call Discount R/C in Las Vegas at (702) 870-9070.

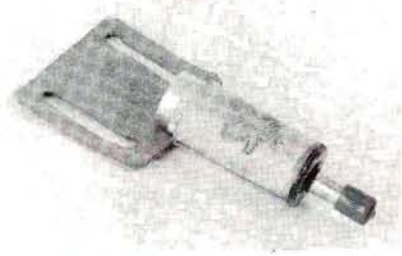


L&M INDUSTRIES
Ball Bearing
Servo Conversion Kit

This Ball Bearing Servo Conversion Kit is for standard Futaba servos (nos. S-28, S-38, S-48, S-128, S-138 and S-148). It was designed to help you avoid the output-shaft sloppiness that gradually develops in standard servos. With the kit, you'll quickly be able to convert any standard Futaba servo into a ball-bearing servo, and at the introductory price, you can convert an entire flight pack for less than the cost of one ball bearing!

Price: $29.95/four, plus $3 S&H; $7.95/single kit, plus $1.50 S&H.

For more information, contact L&M Industries, P.O. Box 292396, Tampa, FL 33687-2396; (813) 980-2685.



HERSCHEL M. COLLINS
Ni-Holster and Kit

The Ni-Holster is made of high-grade 6- to 8-pound leather and should last a lifetime. If you buy the kit to make the holster yourself, as long as you construct it properly, you'll have it forever. Both are backed by a guarantee: if you aren't satisfied, the purchase price and postage will be refunded. The kit can be assembled in about 30 minutes, using tools and materials found on almost every modeler's workbench!

Price: $14.95/ready-to-wear Ni-Holster; $7.95/Ni-Holster Kit, including S&H.

For more information, contact Herschel M. Collins, 211 Maedell Way, Woodland, CA 95695; (916) 666-9218.

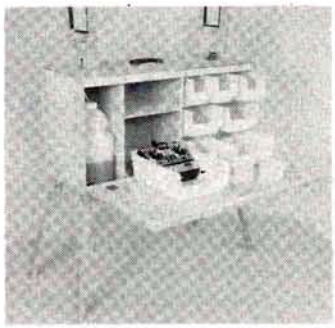
BOB VIOLETT MODELS
Jet Video

Bob Violett Models offers a new professionally produced video that reviews its entire line of jet products. Exciting flight footage includes aerobatic performances of the Sabre and the F-16, and there are exciting grass-field takeoff demonstrations and details about the F-16's scale landing gear .

Part no. BVM50

Price: $15, plus $5 S&H

For more information, contact Bob Violett Models, 1373 Citrus Rd., Winter Springs, FL 32708; (407) 365-5869.



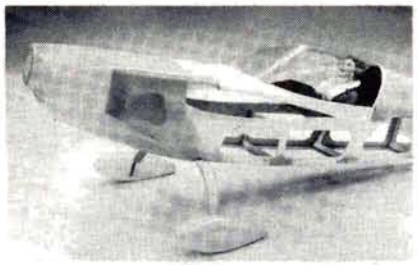
JENNINGS PRODUCTS
Flight Box

Made of light, high-quality, birch plywood and basswood, this 30x12x16-inch flight box has seven indestructible polyurethane drawers (three sizes) and 12 drawer inserts for small parts. Its folding legs are housed in metal brackets for stability and durability, and it's left unfinished, so you can choose your own color scheme. It's available only from Jennings Products.

Price: $89.95, plus UPS shipping

For more information, contact Jennings Products, P.O. Box 1121, Hendersonville, TN 37077-1121; (615) 824-0475; Fax (615) 824-5150.

PRODUCT NEWS

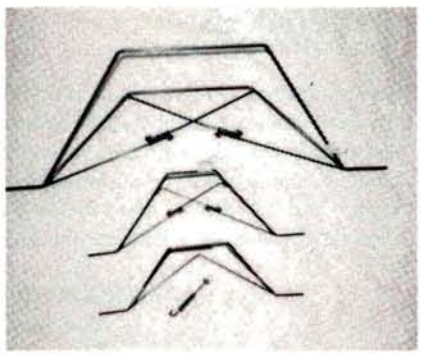


R/C CITY
Extra 300 Cowl and Wheel Pants

R/C City now offers wheel pants and a cowl for the Carl Goldberg Extra 300. They're made of light epoxy/glass and are free of pinholes. R/C City manufactures fiberglass scale and pattern kits, and their products are available from selected dealers, or directly from them (send $1 for a catalogue).

Prices: $30 (cowl); $25 (wheel pants) plus $5 S&H.

For more information, contact R/C City, 96 Railroad Ave. #F, Suisun, CA 94585; (707) 428-3119; Fax (707) 421-2336.



BOB SHATTLEROE
Custom Gear

The latest addition to the Shattleroe catalogue is the landing gear for the Balsa USA 1/3-scale Cub. The gear shown in the center is for the Super Aeromaster; the bottom gear (shown with the suggested spring-loaded J-Bolt) is for the Smith Mini Plane. They're spring loaded and made out of 1/4-inch-thick piano wire. These scale-looking gear offer good shock absorbency for those less-than-perfect landings. The company will soon offer "Bungee Covers" for a true scale look. Send $1 for a full catalogue, and ask about custom work.

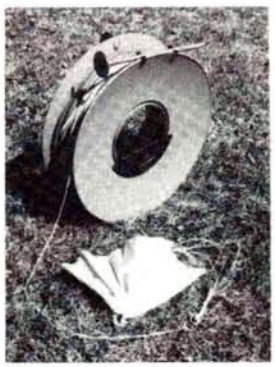
For more information, contact Bob Shattleroe, Custom Gear, Dept. #3, 31985 John Hauk, Garden City, MI 48135; (313) 261-9064.

J.M.D. MODELS
Luscombe Silvaire

J.M.D.'s scale, easy-to-fly, 1/4-scale Luscombe is for sport fliers and competitors. The kit includes a fiberglass fuselage, a cowl, wheel pants, Lexan windows, prebent landing gear and machine-cut ribs, etc. Specifications: wingspan—105 inches; wing area—1,200 square inches; weight—16 pounds; recommended engines—120 FS, G38, ST 2500, O.S. 108.

Price: $285

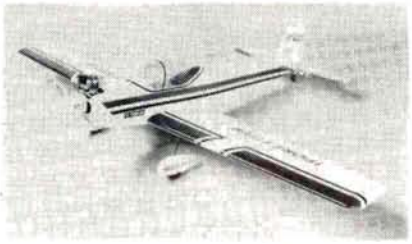
For more information, contact J.M.D. Models, 2667 Columbia Rd., Median, OH 44256; (216) 483-3794.



NORTHEAST SAILPLANE PRODUCTS
Pinnacle Hi-Start

The Pinnacle Hi-Start's design was based on the opinions of NSP's customers about what the ideal high-start should be like. It has UV-protected, one-piece rubber tubing, a specially made Day-Glo orange line, top-quality fittings, and a durable, custom-made parachute that won't tangle! The included capped-steel stake can be snapped onto the reel for transportation. The Pinnacle is available in a variety of sizes. The most popular size—the Pinnacle-L—is for 2- to 3-meter sailplanes and costs $69.95.

For more information, contact Northeast Sailplane Products, 16 Kirby Ln., Williston, VT 05495; (802) 658-9482.



GLOBAL HOBBY DISTRIBUTORS
Sport Flyer 40L ARF

The Sport Flyer 40L ARF has large stabs and a long, slender tail boom. They combine to improve pitch damping and directional stability. A special, 14-percent, symmetrical airfoil allows outstanding aerobatic performance (right-side-up or inverted) and helps you accomplish high-G maneuvers and slower landings. The Sport Flyer offers pattern-like handling, super-stable tracking and gentle flight characteristics. Its light balsa fuselage, balsa stabilizers, and fully balsa-sheeted hollow-core foam wings keep down the plane's wing loading, and it's covered in a tough, colorful, heat-shrink polyester film.

Part no. 111805

Price: $215

For more information, contact Global Hobby Distributors, 10725 Ellis Ave., Suite E, Fountain Valley, CA 92728-8610; (714) 963-0133.

RALPH ROPP MODELS
T-34 Mentor

New from Ralph Ropp Models is this 1/5-scale plan of the 82-inch-wingspan T-34. A kit (which includes formers and wing ribs), a fiberglass cowl and a tail cone are also available.

Price: $25/plan and bill of materials

For more information, contact Ralph Ropp Models, P.O. Box 608, Rocklin, CA 95677; (916) 782-6616.

NAME THAT PLANE

CAN YOU IDENTIFY THIS AIRCRAFT?

If so, send your answer to *Model Airplane News*, **Name That Plane Contest** (state issue in which plane appeared), 251 Danbury Rd., Wilton, CT 06897.

Congratulations to Air Force Staff Sergeant David C. Jones of San Antonio, TX, for correctly naming January's mystery plane. He writes, "The aircraft you have pictured is the XC-99, manufactured by Consolidated/Vultee in the early '40s. [In the picture], the aircraft is under construction at the San Diego plant, prior to its flight to Kelly AFB, TX, where it remains today. The aircraft used many B-36 parts including the wing, tail-group, landing gear and six Pratt & Whitney R-4360 24-cylinder, air-cooled, 3,500hp engines that used water-injection for added power. The XC-99 also had a 230-foot span and a length of 182 feet. It had two decks and four, electric, 10-ton hoists to load cargo." Thanks for the information, Sergeant.

The winner will be drawn four weeks following publication from correct answers received (on a postcard delivered by U.S. Mail), and will receive a free one-year subscription to **Model Airplane News.** If already a subscriber, the winner will receive a free one-year extension of his subscription.

AIRWAVES

(Continued from page 114)

meter sailplanes. Our greatest problem is that the information we get about R/C isn't complete. Unfortunately, we can't subscribe to *Model Airplane News*, so we're looking for contacts with everyone who's interested in Estonian R/C modeling. Perhaps you can help us?

MARGUS VIILUP
Vikerkaare 28
Tartu 202400
Estonia

Margus, we're sure some of our readers will be interested in contacting you, and we'll send you some recent magazines and modeling books for your club's library. If you and your friends have some interesting projects that you'd like to share with our readers, why not send us some pictures and model specifications for our "Pilots Projects" column?

We're always happy to receive correspondence from modelers from other countries.

TA

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